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# Preliminary Draft Environmental Statement for the Federal Coal Management Program

## Volume II

Prepared by the
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ABSTRACT:

This is Volume 2 of two volumes of the Preliminary Draft Environmental Statement for the Federal Coal Management Program proposed by the Department of the Interior. It is a programmatic sttatement, addressing environmental impacts on a regional, non site-specific basis.

THIS DOCUMENT IS A PRELIMINARY WORKING DRAFT. IT IS INTENDED FOR INTERNAL REVIEW PURPOSES. IT WILL BE REVISED IN RESPONSE TO REVIEWER COMMENTS. IN ADDITION, INTERNAL ANALYSIS AND REVISION OF MATERIALS ARE CONTINUING.

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This document is a preliminary working draft of the Department of the Interior's Coal Management Environmental Statement. The document is intended for internal review purposes. It will be revised in response to reviewer comments. In addition, internal analysis and revision of materials are continuing.

# CHAPTER 6

## KEY ISSUES AND PROGRAM CONSIDERATIONS

This chapter addresses the issues that are of major importance in shaping the Federal coal management program. These are broad issues that apply across the board to all leasing strategies. They are presented here so that they can be put into context and treated together.

## 6.1 KEY ISSUES AND PROGRAM CONSIDERATIONS

### 6.1.1 Ownership Pattern Considerations

Ownership patterns in Known Recoverable Coal Resource Areas (KRCRAs*) are a primary consideration in coal exploration and development. Ownership alone may determine what resources will be explored, what reserves will be developed, and whether or not a particular coal deposit can be economically recovered. Ownership patterns range from simplistic to unresolvable. These extremes are separated by types of tenure, reflecting the changing governmental policies for public domain lands discussed in Chapter 1. The complexity of ownership patterns is demonstrated, in part, in Table 6-1.

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*A KRCRA is defined as an area classified by the USGS for coal leasing and containing technically recoverable coal. Criteria for minimum coal thickness, maximum coal depth, and the areal extension of drill hole and outcrop information are defined specifically for each KRCRA. In some instances, the limits of the KRCRA are based on administrative boundaries such as Indian Reservations and other large areas of non-Federal coal. Presence of some Federally-owned coal is a requirement for the existence of a KRCRA. However, non-Federal ownership is possible and, in fact, dominant in some KRCRAs.

TABLE 6-1

KNOWN RECOVERABLE COAL RESOURCE AREAS OWNERSHIP PATTERNS
FOR SIX WESTERN COAL STATES (a)

| KNCRA UNIT | P.D. SURFACE FED COAL(a) | P.D. SURFACE NON-FED COAL | PRIVATE SURFACE FED COAL | PRIVATE SURFACE NON-FED COAL | STATE SURFACE FED COAL | STATE SURFACE NON-FED COAL | F.S. SURFACE FED COAL | F.S. SURFACE NON-FED COAL | L.U. SURFACE FED COAL(b) | L.U. SURFACE NON-FED COAL | FED W/DRAWAL FED COAL(c) | FED W/DRAWAL NON-FED COAL | INDIAN LANDS FED COAL(d) | INDIAN LANDS NON-FED COAL | GRAND TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COLORADO | | | | | | | | | | | | | | | |
| Cimarron Ridge | 3,120 | | 10,400 | 4,920 | | | 2,000 | | | | 80 | | | | 20,520 |
| Danforth Hills | 46,850 | 2,560 | 101,230 | 16,970 | | 4,350 | | | | | 640 | | | | 172,600 |
| Denver Basin | | | 94,800 | 348,980 | 1,200 | 28,560 | | | | | 640 | | | | 474,180 |
| Durango | 27,750 | 120 | 58,150 | 70,680 | 2,910 | 20,780 | 53,610 | 3,140 | | | 480 | | | 1,120 | 238,740 |
| East Cortez | 1,720 | | 400 | 6,160 | | 1,440 | | | | | | | | | 9,720 |
| Lower White River | 152,320 | 40 | 13,200 | 4,700 | | 3,840 | | | | | 2,920 | | | | 177,020 |
| McCallum | 18,400 | 240 | 5,040 | 15,120 | 2,640 | 4,640 | | | | | 800 | | | | 46,880 |
| Nucla | 1,880 | | | 3,080 | | | | | | | 120 | | | | 5,080 |
| Paonia-Somerset | 31,560 | 80 | 65,640 | 22,690 | | | 94,980 | | | | 600 | | | | 215,550 |
| Yampa | 36,970 | 3,640 | 269,300 | 101,675 | 640 | 40,990 | 2,060 | 640 | | | 10,965 | 120 | | | 467,000 |
| MONTANA | | | | | | | | | | | | | | | |
| Bull Mountains | | | | | | | | | | | | | | | |
| Burns Cr.-13 Mile Cr. | 400 | 320 | 98,640 | 120,480 | 3,440 | 15,360 | | | | | | | | | 238,640 |
| Circle | 5,680 | | 181,240 | 225,760 | 3,360 | 25,160 | | | | | | | | | 441,200 |
| Knowlton | 120 | 1,460 | 1,840 | 8,280 | | 1,680 | | | 6,000 | 760 | | | | | 20,140 |
| Lame Jones Cr. | 1,640 | | 6,320 | 25,320 | | 3,240 | | | 5,720 | 520 | | | | | 42,760 |
| Pine Hills | 1,040 | | 6,200 | 10,120 | | 600 | | | | | | | | | 17,960 |
| Powder River Basin | 193,430 | 60 | 1,046,895 | 443,560 | 21,190 | 107,980 | 434,515 | 3,120 | | | 2,470 | 1,840 | | 1,120 | 2,266,180 |
| Sidney | 17,800 | 480 | 103,660 | 159,660 | 3,800 | 18,160 | | | | | | | | | 303,560 |
| Wibaux Beach | 4,200 | | 96,680 | 70,600 | 80 | 2,280 | | | | | | | | | 173,840 |
| NORTH DAKOTA | | | | | | | | | | | | | | | |
| Bowtan-Gascoyne | | | 74,910 | 131,680 | 2,120 | 2,240 | 2,890 | | 50,490 | 17,710 | 240 | 1,280 | | | 283,560 |
| Dickinson | | | 80,440 | 310,520 | 320 | 2,240 | | | 4,440 | 1,000 | | | | | 398,960 |
| Knife River | 640 | | 322,600 | 802,890 | 600 | 27,960 | | | | | 3,740 | 4,610 | | | 1,163,040 |
| New England-Mott | 40 | | 186,970 | 346,680 | 160 | 9,040 | | | 20,650 | 1,280 | | | | | 564,820 |
| Niobe | | | 880 | 15,040 | | 120 | | | | | | | | | 16,040 |
| Velva | | | 3,200 | 17,600 | | 120 | | | | | | | | | 20,920 |
| Williston-Avoca | 120 | | 42,160 | 18,840 | 440 | 2,880 | | | | | 300 | 290 | | | 64,030 |
| NEW MEXICO | | | | | | | | | | | | | | | |
| La Ventana | 172,840 | 3,420 | 39,380 | 8,200 | 4,960 | 16,240 | | | 32,960 | 80 | 320 | 80 | 24,720 | 22,640 | 325,840 |
| San Juan | 1,007,140 | 23,500 | 165,200 | 89,940 | 19,320 | 115,960 | 7,040 | | 55,480 | 320 | 6,900 | | 269,600 | 74,960 | 1,835,360 |
| Tsaya | 5,320 | | 40 | 240 | | 6,200 | | | | | | 200 | 39,420 | 34,100 | 85,520 |
| UTAH | | | | | | | | | | | | | | | |
| Alton-Kanab | 48,040 | 1,160 | 27,380 | 11,450 | 280 | 2,680 | 25,040 | | | | | | | | 116,030 |
| Book Cliffs | 42,440 | 280 | 39,540 | 38,960 | 1,600 | 6,560 | | | | | | | | | 129,380 |
| Henry Mountains | 34,540 | | | 40 | | 5,480 | | | | | 400 | | | | 40,460 |
| Kaiparowits Plateau | 397,760 | 2,520 | 1,780 | 1,160 | 80 | 46,320 | 71,600 | 200 | | | 10,760 | 400 | | | 532,580 |
| Wasatch Plateau | 12,120 | | 36,640 | 47,320 | 2,720 | 5,360 | 192,650 | 840 | | | | | | | 297,650 |
| WYOMING | | | | | | | | | | | | | | | |
| Grass Creek | 360 | | 320 | 720 | | 120 | | | | | | | | | 1,520 |
| Hanna-Carbon Basin | 85,493 | 160 | 6,454 | 116,367 | 760 | 7,343 | | | | | 6,649 | | | | 223,226 |
| Kemmerer | 105,260 | | 18,053 | 125,751 | 1,163 | 14,004 | | | | | 2,331 | | | | 266,562 |
| Powder River Basin | 390,901 | 1,831 | 2,767,827 | 276,606 | 24,418 | 365,119 | 55,986 | 5,040 | 57,307 | 29,243 | 11,060 | | | | 3,985,338 |
| Rawlins (Little Snake River) | 49,863 | 40 | 16,155 | 48,761 | 480 | 5,280 | 160 | | | | 3,050 | 40 | | | 123,829 |
| Red Desert | 453,267 | 640 | 7,834 | 309,076 | 80 | 12,040 | | | | | 880 | | | | 783,817 |
| Rock Springs | 430,487 | 120 | 7,739 | 312,905 | 249 | 18,467 | | | | | 4,973 | | | | 774,940 |
| TOTAL | 3,781,511 | 42,671 | 6,005,137 | 4,689,501 | 99,010 | 950,833 | 942,531 | 12,980 | 233,047 | 50,913 | 71,318 | 8,860 | 333,740 | 133,940 | 17,355,992 |

(a) Includes BLM administered lands.
(b) Includes both USFS and BLM administered lands.
(c) Includes all Federal withdrawals regardless of agency or type except Indian withdrawals.
(d) Includes Indian withdrawals.

Key: P.D. = Public domain.
F.S. = Forest service.
L.U. = Limited use.

6.1.1.1 Types of Ownerships

Through the broad range of land ownership patterns, there are certain general patterns of ownership prevalent in the various KRCRAs. In states west of the Mississippi River, the Federal Government directly controls about 70 percent of the KRCRAs through retention of both surface and coal rights. Through land ownership patterns along the old railroad right-of-way, the Federal Government indirectly controls an additional 20 percent in the adjacent lands. The Federal Government currently has leased an estimated 17.3 billion tons of the reserves and an additional 10.3 billion are contained in Preference Right Lease Applications (PRLAs).

A considerable portion of these western KRCRAs (perhaps 50 percent) are under private surface with coal rights reserved by the Federal Government. The largest portion of the balance of these Federal resources are in Indian reservations and other Federal reservations not administered by the Bureau of Land Management (BLM). The balance is held by private ownership, including both coal mining companies and family or individual ownership.

Checkerboarding* is also prevalent in certain western states. Fee simple title was given to these lands, including all mineral rights. Although many of these holdings have subsequently been sold to other interests, they still comprise the largest single private

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*Checkerboarding refers to the policy of transferring land title to sections of land adjacent to railroad rights-of-way. These transfers were used as incentives to the railroads to develop large portions of the west between 1840 and 1910.

land holding pattern in the western states. Under the Bankhead-Jones Act, railroads holding title to checkerboarded lands cannot mine coal other than for corporate consumption.

KRCRAs affected by checkerboarding are in the Green River-Hams Fork, Powder River Basin, and Fort Union Coal Regions. The surface holding patterns for large tracts of the old railroad grants have been kept intact by either the railroads or subsequent interests. Most of the areas are suitable only for ranching, causing large blocks to be kept intact as this is the only profitable use of the land.

The mineral estates of these lands have not undergone the same state of preservation. Where not still retained by the original railroad company, these titles are generally often ensnarled with split titles and compound ownership. Several pronounced blocks remain intact and are now under consideration for coal mine development. One of the problems in these areas is acquiring a suitable lease on alternating Federal sections. Currently nominated identifiable blocks in this area usually include at least three townships.

Unless the Federal checkerboarded areas are leased to adjacent land owners, the probability of adjacent resources being proven and developed is small unless private lands can be acquired. This difficulty is compounded by the Federal Coal Lease Amendments Act requiring that future Federal leases must form logical mining units. Checkerboard mining in these areas, either by strip or deep techniques,

would result in poor recovery and may cause as much as an 80 percent waste of the resource as adverse ownership blocks become bypassed. The 80 percent loss estimate includes both the coal contained in unmined blocks and in adjacent areas which cannot be mined without interferring with adjacent surface rights.

In the eastern states, the Federal Government controls about 4.6 million acres in KRCRAs in Alabama, Arkansas, Kentucky, Mississippi, and Virginia. The balance of the KRCRAs are owned in a highly complex pattern of state, local government, and private ownerships.

Eastern KRCRA properties are described by metes and bounds (unless the lands were subject to the public land survey system). These parcels are usually of irregular shape, governed to some extent by natural or topographical features. It is difficult under this system to identify owners and their various tenures. Aside from dedicated parks, forests, military bases, and scattered parcels, the effects of governmental ownership in this area is small in comparison to the western states.

In the western states, however, there are substantial holdings of non-Federal coal. Railroads retain large holdings of coal in checkerboard areas which were originally railroad land grants. The Federal Government did not make it a general practice to retain coal rights in its land disposals until the early twentieth century, resulting in large-scale transfers of coal ownership to the private sector in earlier years. The development potential of these

reserves, however, is limited by the highly fragmented coal ownership patterns in the West. In such checkerboard areas, development on private lands would have to proceed one section at a time if the intervening Federal and state sections were not available. This would impose a high economic cost and would also have undesirable environmental consequences, particularly since the acres involved in the amount of mining required to meet desired production levels would be scattered over an area twice the size of the area necessary under a condition of single ownership. With this occurring, there would be no way to avoid impacts to the areas not being mined, with the result that mining under split ownership conditions would cause impacts in varying degrees to twice the surface area effect by mining of single-ownership lands. There is also a potential that mining of the remaining coal in such split ownership areas would be required at some time in the future and the total area originally disturbed by the first phase of mining would be disturbed all over again, producing a second series of impacts to the same land.

Non-Federal coal in split ownership areas would have a poor resource development potential without the addition of Federal coal and vice versa. The effect of isolating large blocks in such a manner is therefore not in the interest of conservation of resources and would also impair reclamation efforts on surrounding lands. If mining cannot be conducted without isolating large tracts, any outstanding (unleased) lands, particularly in the Powder River and Green River-Hams Fork KRCRAs would be untouched and the coals resources on these lands would remain undeveloped.

### 6.1.2 Concentrating Development in Areas of Existing Production

The concept of concentrating new coal development in those portions of a region in which there is existing production is not a separate management alternative but rather a potential tool which might be used in directing where the regional levels of development under the various alternatives discussed in this environmental impact statement might best occur. A basic assumption in directing development within a region in such a manner would be that the demands associated with new development could be more easily handled through a centralized point of control or localized infrastructure serving concentrated development than would be the case with a random dispersion of development. While this may be true for certain demands of new development and, indeed, may be true for development in a particular region or portion of a region, there are several potential problem areas inherent in development concentration. These problem areas would be a vital factor in deciding whether to direct development in a concentrated manner within a particular region and, since the possibility of solving such problems would be highly dependent on the particular region or subregion involved, development concentration cannot be considered as a general, across-the-board method of development management but rather as one of the several methods of best managing new development.

The principal benefits that could occur in terms of the major areas of environmental consideration are primarily associated with the socioeconomic aspects of a particular area rather than the physical or

biological aspects. Concentrated development could allow for centralization of requisite planning efforts within a single county or small number of counties in a region. This could in turn allow for uniformity in regional planning that would not necessarily occur with random dispersion of development. Planning efforts could be directed toward the single new community or the expansion of a single existing community which would be the focal point of support for the concentrated development. Housing and community services would be centralized and could potentially benefit from the economies of scale of a single larger community as opposed to a scattering of smaller communities. Services such as schools, police and fire protection, and waste handling could potentially be provided at a greater level of efficiency and effectiveness through centralization of efforts.

These same potential benefits, however, are also potentially significant disadvantages to a county or community due to concentrated development. Rapid population growth associated with concentrated development would require a similarly rapid growth in facilities and services and serious problems can occur due to a time lag in supplying the increased levels of public goods and services. Any time lag in supplying services is most often related to financial problems where needs for new capital and operating expenditures arrive far more rapidly than new revenue receipts. Similarly, conflicts might occur between those jusidictions receiving new revenues and other jurisdictions that need to increase expenditures to service new residents. For example, a county may

directly receive tax revenues from mining while a city within the county might have to provide services for the resultant population increase without directly sharing in this increased tax revenue.

It should be noted at this point that some development concentration is presently occurring, not as the result of a specific program option but rather the result of a naturally-occurring resource concentration and the favorable economic conditions accompanying this concentration. Within the Campbell County, Wyoming, portion of the Powder River Coal Region, there are presently 15 coal mines either in operation, under construction or for which environmental impact statements are being prepared. This concentration of development within the 15 by 50 mile corridor in the eastern part of the county is due to the occurrence of coal with seam thicknesses of 70 to 80 feet.

The effects of development concentration on the physical and biological facets of environmental resources would primarily be disadvantageous or perhaps neutral. The amount of land disturbed in connection with concentrated versus dispersed development within a region would be a neutral effect just in terms of acres affected in that the same number of acres would basically be required for either type of development except for such minor variations as the possible joint use of a rail spur under concentrated development conditions. For other aspects of the physical environment, however, concentrated development would produce levels of impacts that could seriously affect air or water quality or could add significantly to the water

demand within an area. The levels of air pollutants associated with concentrated development could lead to the violation of air quality standards within a region. This has been the case in the Colstrip area of Montana where concentrated development has produced particulate levels that exceed national primary air quality standards. Similarly, potential water pollutants would more likely be directed toward a single water system with concentrated development, thereby increasing the probability of producing significant impacts to water quality. The increase in water demand associated with such development could potentially exceed the development area's supply or could preempt other development within the area due to the water requirements of concentrated development. The potential for effects on biological resources is basically dependent on habitat disturbance and the amount or area of such disturbance would be approximately the same with concentrated development as with dispersed development. However, the potential would be greater with concentrated development for disturbing a major portion of a particular type of habitat within a specific area with a resulting potential for significant impacts to the wildlife supported by that particular habitat.

6.1.3 Leasing Federal Coal for Surface/Underground Mining

One of the major marketing attractions of Western coal is that for the six major coal-producing states in the West in which Federal coal lands predominate, approximately 90 percent of current production is by relatively low-cost surface mining. Except in Utah, where all recent production has been by underground mining, and Colorado, in which about one-third of production also is deep-mined, there is comparatively little underground mining in the six major states. In 1976, excluding Colorado and Utah, over 98 percent of production in the major states was produced by surface methods, as indicated below (in thousand short tons):

| | Underground | Surface | Total |
|---|---|---|---|
| Colorado | 3,283 | 6,154 | 9,437 |
| Montana | - | 26,231 | 26,231 |
| New Mexico | 836 | 8,924 | 9,760 |
| North Dakota | - | 11,102 | 11,102 |
| Utah | 7,967 | - | 7,967 |
| Wyoming | 524 | 30,312 | 30,836 |
| Total | 12,610 | 82,723 | 95,333 |

Table 6-2 shows that of the demonstrated coal reserve base in the six states, 115.2 billion tons (57.3 percent) are potentially mineable by underground methods, and 85.8 billion tons (42.7 percent) are surface mineable. With respect to recoverable coal reserves in these states, however, Table 6-3 shows that of the total recoverable reserves held under Federal lease, 66 percent are strippable and 34 percent are mineable by underground methods.

Table C-2

The Demonstrated Coal Reserve Base of Potentially Mineable Coal by Underground and Surface Methods in Major Federal Coal-Leased States of the West[1]
(In Million Short Tons)

| | Bituminous | | Subbituminous | | | Total | | |
|---|---|---|---|---|---|---|---|---|
| | Underground | Surface | Underground | Surface | Lignite Surface | Underground | Surface | Grand Total |
| Colorado | 9,227 | 870 | 4,745 | - | - | 13,972 | 870 | 14,842 |
| Montana | 1,384 | - | 64,450 | 35,464 | 7,098 | 65,834 | 42,562 | 108,396 |
| New Mexico | 1,527 | 250 | 607 | 2,008 | - | 2,134 | 2,258 | 4,392 |
| No. Dakota | - | - | - | - | 16,003 | - | 16,003 | 16,003 |
| Utah | 3,780 | 262 | - | - | - | 3,780 | 262 | 4,042 |
| Wyoming | 4,524 | - | 24,997 | 23,845 | - | 29,521 | 23,845 | 53,366 |
| Total | 20,442 | 1,382 | 94,799 | 61,317 | 23,101 | 115,241 | 85,800 | 201,041 |

[1] "The Environmental Impact Statement, Proposed, Federal Coal Leasing Program," U. S. Department of the Interior, 1975

Table 6-3

Strippable and Underground Recoverable Coal Reserves
Held Under Federal Lease[1]
(In Million Short Tons)

| | Strippable | Underground | Total |
|---|---|---|---|
| Colorado | 273 | 1,377 | 1,650 |
| Montana | 1,181 | 0 | 1,181 |
| New Mexico | 278 | 57 | 335 |
| No. Dakota | 268 | 0 | 268 |
| Utah | 265 | 3,319 | 3,584 |
| Wyoming | 8,361 | 704 | 9,065 |
| Total | 10,626 | 5,457 | 16,083 |
| % of Total | 66.1 | 33.9 | 100.0 |
| Other States | 14 | 226 | 240 |
| Grand Total | 10,640 | 5,683 | 16,323 |

[1] "The Environmental Impact Statement, Proposed, Federal Coal Leasing Program," U.S. Department of the Interior, 1975

In the six states, the percentage of underground coal produced has declined consistently over the past 20 years (11 percent in 1977). Conversely, production by surface mining has increased steadily over the period, to approximately 90 percent in 1977.

Production by underground mining is more costly than by surface mining, as reflected in the average values of coal f.o.b. mines. The average in Utah, where all production is by underground mining, was $19.84 per ton in 1975 and $22.93 per ton in 1976. In 1975, approximately 4.3 million tons were sold in the open market at $14.21 per ton f.o.b. mines. Over 2.7 billion tons were not sold in the open market (captive coal) at a value of $28.24 per ton. For other states, in which surface mining predominates or is exclusive, the values f.o.b. mines in 1976 range as follows: $3.74 in North Dakota (all of which was surface-mined lignite) and $4.90/ton in Montana (all surface mined). In Wyoming, where practically all tonnage is surface mined, the average value was $7.00/ton.

Among other reasons for the preference for surface mining in the west is its high rate of productivity, which strongly influences costs and prices. The average tons per man per day in 1975 were as follows:

| | Underground | Surface | Total |
|---|---|---|---|
| Colorado | 10.43 | 45.62 | 18.89 |
| Montana | - | 127.25 | 127.25 |
| New Mexico | 9.34 | 51.23 | 36.36 |
| North Dakota | - | 86.86 | 86.86 |
| Utah | 13.85 | - | 13.85 |
| Wyoming | 10.79 | 67.74 | 61.78 |

Except for coal for metallurgical purposes and coal used generally within indigenous areas, deep-mined Western coal has less expansive market potential than for surface-mined coal. In 1976, approximately 27.5 percent of Colorado coal was shipped for metallurgical use and 63.6 percent was used for electric power generation, much of the latter being from surface-mined coal. The balance was shipped for various other purposes. Approximately 20 percent of Utah coal was consumed in 1976 at coke plants, 53 percent was shipped to electric utilities, and 27 percent was used for other purposes. Virtually all North Dakota coal was used for electric power generation, as was 98 percent of Montana coal and 91 percent of Wyoming coal.

Current and actively proposed surface mining in general will be considerably affected by the rules and regulations established under the Surface Mining Control and Reclamation Act of 1977. However, rather than reduce overall production per se, it is likely that, because of the enormous surface-mineable reserves in Federal coal land states, there will be a shift, where necessary, to new surface mining ventures that can comply with the regulations.

Projections for the future of Western coal revolve primarily around the development of surface mining. The low costs and low sulfur content of surface mineable coal in the West offset, to a considerable extent, the generally lower heating values (Btu's) of Western coals and transportation costs on shipments outside the producing areas. Significantly, however, the greatest potential for

Western coal over the next two decades appears to be in its use within the West to meet the heavily expanding demands of new coal-fired power generation.

### 6.1.4 Control End Uses of Coal

This section describes the environmental impacts associated with the construction and operation of three hypothetical large coal-fueled plants. The object of examining these three plants is to identify the major environmental loadings that could be produced by their construction and operation.

Each scenario assumes the establishment of a coal conversion plant at a load center, i.e., in close proximity (within 50 miles) of a central business district (CBD). The location of these plants would be restricted, to a certain extent, by plant operational requirements (land, water, and type of coal), by the relationship between potential plant air and water emissions and existing Federal/State laws, and by the type of energy required within the load center. Although cost data are given in 1978 dollars wherever possible, the actual costs of construction and operation of the facility could be substantially higher since these scenarios envision a time frame of about 10 to 20 years from now. Construction of the plants would begin in 1990 with full operation of the facilities 4 to 5 years later. This time frame was chosen as it provides a reasonable lead time for current experimental fossil fuel technologies to be perfected and successfully deployed. For analytical purposes, two of the load centers are assumed to be located in metropolitan areas while the third would be situated near the site of mine mouth operation in a predominantly rural setting.

The scope of analysis in these scenarios takes into account only primary environmental loadings relating to land, air, water, and the

socioeconomic characteristics of the area. General background information relative to the location of the load center, type of conversion plant to be constructed, resource requirements, and impacts are discussed in the following paragraphs. More detailed information on the scenarios appears in Appendix D.

The first load center chosen for analysis is an SMSA (Standard Metropolitan Statistical Area) whose population exceeds 1.2 million by the year 1990 and is located on the shores of one of the Great Lakes. An older industrialized center, the city has an extensive water and rail network. In addition, it experiences moderate to harsh winters with frequent natural gas shortages. To respond to these shortages, a high-Bty hidrogasification plant producing 250 million standard cubic feet per day (MMSCFD) would be constructed. This type of facility was selected for that load center since the area requires natural gas, and possesses sufficient water resources and a well developed transportation grid. Coal to feed the plant would be strip mined in the Northern Appalachian Coal Region.

Similar to the first load center, the second region selected is also an SMSA, with a projected population of about 1.7 million in the year 1990 and is located in the arid southwest adjacent to national parks and forests. This load center is experiencing very rapid growth. As a result of climate and population increases, water resources are limited. A magnetohydrodynamic (MHD) power plant would be constructed at this load center, producing 1000 Megawatts (MW) of electricity. The

MHD type of facility was selected as it requires less water than other coal conversion processes and is considerably "cleaner" with respect to air pollution. It's coal supply would be from strip mining in the San Juan Coal Region.

Situated in the Great Northern Plains Region, the third load center would be a rural community with a projected population of about 11,000 in 1990. Agriculture and related industries are the principal sources of local income. Historically, growth has occurred here at a much slower rate than most of the country. However, in the past few hears, this area has experienced an accelerated pace of development due to the recent introduction of heavy mining operations. A conventional steam electric power plant with an annual generating capacity of 1050 MW would be installed in the vicinity of this load center. Low sulphur bituminous coal will be supplied to the plant from a local underground mine. This scenario was developed since it reflects a present trend in Western states that is expected to continue past the year 2000.

Great Lakes Gasification Plant

This high-Btu hydrogasification plant would produce 250 MMSCFD of pipeline quality gas. The plant would operate 328 days a year (90 percent load factor) and require 15,500 tons of coal per day. Water intake would be approximately 9.8 million gallons per day (11,000 acre feet per year). The plant would require 900 acres of land initially with an additional requirement of 25 acres each year of operation for disposal of 2000 tons of solid waste per day, mainly ash. Coal would

be delivered to the plant utilizing 3 unit trains entering the site every two days. (A unit train of 100 cars would carry 10,000 tons, 100 tons per car.) Table 6- lists plant resource requirements and contains a summary of primary environmental loadings.

Southwest Power Plant

This MHD power generating plant would produce 1,000 MW of electricity and would operate 220 days a year (60 percent load factor). Coal demand would be approximately 8,200 tons per day. Water intake would be about 8 million gallons per day (9,000 acre feet per year). The MHD plant site would require 300 acres, with an additional 6-7 acres per year for solid waste disposal. Solid waste discharges would be about 780 tons per day. Coal would be delivered to the plant using 1 unit train per day. Ninety additional acres of land would be disturbed annually by strip mining to provide coal to the plant. Table 6-4 lists plant resource requirements and contains a summary of primary environmental loadings.

Northern Great Plains Steam Power Plant

A coal-fired steam electric generating plant consisting of three units of 350 MW generating capacity would be constructed to produce a total net output of 1050 MW of electricity to a large western city. The site of the proposed plant is adjacent to a currently active underground bituminous coal mine located in a Northern Great Plains State. Coal requirements of 18,000 tons per day for the full operation of the plant would be provided by a system of conveyor belts from the mine to the active storage area of the facility. Approximately 4,000 acres of

TABLE 6-4

ENVIRONMENTAL IMPACTS OF
COAL PLANT CONSTRUCTION

| CHARACTERISTICS | HIGH BTU GASIFICATION PLANT | MHD POWER PLANT | CONVENTIONAL POWER PLANT |
|---|---|---|---|
| Output | 250 MMSCFD | 1,000 MW | 1,050 MW |
| Location (area) | Great Lakes | Southwest | Northern Great Plains |
| Coal Feed/Day (tons) | 15,500 tons | 8,200 | 18,000 |
| Coal Source | Northern Appalachia | San Juan Region | Northern Great Plains |
| Mine Type | Strip | Strip | Underground |
| Land for Plant (acres) | 900 | 300 | 4,000 |
| Land for Disposal (acres/yr) | 25 | 6 | --- |
| Land for Mine (acres/yr) | 300 | 90 | N/A |
| Water Required (acre-ft/yr) | 11,000 | 9,000 | 14,000 |
| Construction Workers | 1,500 | 1,000 | 1,800 |
| Operators | 1,000 | 500 | 350 |
| Worker Wages (peak year) | $66 million | $37 million | $64.4 million |
| Plant Investment | $1 billion | $600 million | $1.2 billion |
| Plant Operating Budget (1977 dollars) | $300 million/year | $100 million/year | $210 million/year |
| Waste Water (GPD) | Closed system | 2 million | 12.5 million |
| Solid Waste (tons/day) | 2000 | 800 | 2300 |
| $SO_x$ Emissions (tons/day) | 2 | 8 | 4.8 |
| $NO_x$ Emissions (tons/day) | 17 | 26 | 4.2 |
| CO Emissions (tons/day) | 3 | Negligible | Negligible |
| HC Emissions (tons/day) | 13 | Negligible | Negligible |
| TSP Emissions (tons/day) | 1 | 10 | 0.49 |

land would be needed for the construction of the generating station. When fully operation, the plant would use about 12.5 million gallons of water per day (14,000 acre feet per year). Table 6- lists plant resource requirements and contains a summary of primary environmental loadings.

6.1.5 Coal and Agricultural Conflicts

6.1.5.1 Land Use

Substantial quantities of farmland (cropland, pastureland, rangeland, forestland) would be disturbed by each coal management alternative. The amount of farmland disturbed by the Preferred-High Level Alternative is estimated to be 165,498 and 148,483 acres during 1985 and 1990, respectively. Acres disturbed by region are:

| Region | 1985 | 1990 |
|---|---|---|
| N. Appalachia | 29,455 | 26,983 |
| C. Appalachia | 18,616 | 22,213 |
| S. Appalachia | 15,407 | 10,571 |
| Eastern Interior | 24,242 | 24,852 |
| Western Interior | 16,823 | 13,169 |
| Texas | 18,571 | 19,754 |
| Powder River | 11,266 | 8,107 |
| Green River-Hams Fork | 12,142 | 7,621 |
| Fort Union | 7,184 | 4,855 |
| San Juan River | 4,863 | 3,444 |
| Uinta-Southwestern Utah | 3,288 | 3,472 |
| Denver-Raton Mesa | 3,641 | 3,442 |

The key issue with respect to coal mining and agricultural land use conflicts is whether premining productivities for mined farmland would be reclaimed.

Non-Prime Farmland

Section 519(c) of the Surface Mining Control and Reclamation Act stipulates that the regulatory authority shall retain that amount of bond for the revegetated area which would be sufficient for a third party to cover the cost of reestablishing revegetation. Sections 515 (b) 20 and 519(c) state that the mining and reclamation operation shall assume the responsibility for successful revegetation for a period of five full years after the last year of augmented seeding, fertilizing, irrigation, or other work except in those areas or regions of the country where the average annual precipitation is 26 inches or less. In the latter, the operator's assumption of responsibility and liability will extend for a period of ten full years. For intensive agricultural land uses, the applicable period shall commence at the date of initial planting.

The Act does not define "sucessful revegetation" and therefore, does not guarantee reclamation of premining productivities. The Act makes no provision for areas which would require more than ten years to reclaim premining productivities. Section 4.2.1 presents evidence that such reclamation could require 14-15 years in certain regions.

The Department of the Interior, Office of Surface Mining Reclamation and Enforcement is responsible for publishing and promulgating regulations necessary to carry out the purposes and provisions of the Surface Mining Control and Reclamation Act (Section 201(c)). In the draft regulations made available to the public beginning on 21 July

1978 (U.S. Department of Interior, 1978hhhh), Section 816.55(f)(iii) requires that crop production from the mined area shall be equal to that of a reference area, approved by the regulatory authority, for a minimum of two growing seasons. Production shall not be considered equal if it is less than 90% of the production of the reference area for any significant portion of the mined area. No regulation requires the comparison of rangeland, pastureland, or forestland production on mined land to a reference area.

In summary, the Surface Mining Control and Reclamation Act does not stipulate that non-prime farmlands must be restored to premining productivities. Draft regulations proposed by the Office of Surface Mining Reclamation and Enforcement establish provisions to assure reclamation of cropland to premining productivity levels but not rangeland, pastureland, or forestland.

Prime Farmland

The Surface Mining Control and Reclamation Act has several provisions attempting to assure reclamation of premining productivities on prime farmland:

(1) The regulatory authority shall, after consultation with the Secretary of Agriculture, and pursuant to regulations issued hereunder by the Secretary of the Interior with the concurrence of the Secretary of Agriculture, grant a permit to mine on prime farmland if the regulatory authority finds in writing that the operator has the technological capability to restore such mined area, within a reasonable time, to

equivalent or higher levels of yield as non-mined prime farmland in the surrounding area (Section 510(d)(1)).

(2) No part of the performance bond or deposit shall be released until soil productivity for prime farmlands has returned to equivalent levels of yield as non-mined land of the same soil type in the surrounding area.

(3) Section 507(b)(16) stipulates that the mining and permit application must contain, for those lands in the permit application which a reconnaissance inspection suggests may be prime farmlands, a soil survey made or obtained according to standards established by the Secretary of Agriculture in order to confirm the exact location of such prime farmlands.

(4) Section 515(b)(7) stipulates that for all prime farmlands identified in Section 507(b)(16) above, specifications for soil removal, storage, replacement, and reconstruction shall be established by the Secretary of Agriculture, and the operator shall, as a minimum, be required to:

(a) segregate the A horizon of the natural soil, except where it can be shown that other available soil materials will create a final soil having a greater productive capacity; and if not utilized immediately, stockpile this material separately from other spoil, and provide needed protection from wind and water erosion or contamination by other acid or toxic material;

(b) segregate the B horizon of the natural soil, or underlying C horizons of other strata, or a combination of such horizons or other strata that are shown to be both texturally and chemically suitable for plant growth and that can be shown to be equally or more favorable for plant growth than the B horizon, in sufficient quantities to create in the regraded final soil a root zone of comparable depth and quality to that which

existed in the natural soil; and if not utilized immediately, stockpile this material separately from other soil, and provide needed protection from wind and water erosion or contamination by other acid or toxic material;

(c) replace and regrade the root zone material described in (b) above with proper compaction and uniform depth over the regraded spoil material; and

(d) redistribute and grade in a uniform manner the surface soil horizon described in subparagraph (a);

In the draft regulations made public on 21 July 1978 by the Department of the Interior, Office of Surface Mining Reclamation and Enforcement (U.S. Department of Interior, 1978hhhh), prime farmland is defined as those lands which:

(1) have been used for the production of cultivated crops, including nurseries, orchards, and the specialty crops, and small grains for at least 5 years out of the 20 years preceding the date of the permit application, and

(2) meet the specific technical criteria prescribed by the Secretary of Agriculture as published in the Federal Register on August 23, 1977. To be considered, prime farmland soils must meet all 9 of the criteria established.

Also, prime farmland shall be identified on the basis of soil surveys submitted by the applicant (U.S. Department of the Interior, 1978hhhh). Soil surveys shall be conducted according to standards of the National Cooperative Soil Survey. All data needed to address the technical criteria mentioned previously must be provided by the applicant. A map with descriptions of each soil mapping unit must also be provided.

The applicant shall submit to the regulatory authority a plan for the mining and restoration of any prime farmland within the proposed permit boundaries (U.S. Department of Interior, 1978hhhh). The plan shall be used by the regulatory authority in judging the technological capability of the applicant to restore prime farmlands. The regulatory authority shall consult with the Secretary of Agriculture before permit issuance. The Secretary of Agriculture has assigned his responsibilities to the Administrator of the U.S. Soil Conservation Service and the latter will carry out the consultation and review through the appropriate State Conservationist.

The applicant must also demonstrate the ability to fulfill a number of "Special Requirements" during the mining and reclamation process (U.S. Department of Interior, 1978hhhh). These requirements deal mainly with soil horizons separation, stockpiling, and backfilling.

Although sufficient regulations appear to exist which will require the reclamation of premining productivities on mined prime farmland, the latter has not been demonstrated in all, if any, of the coal regions (see Section 4.2.1). Provisions were established in the Surface Mining Control and Reclamation Act which permit the protection of those areas in which long-term productivity may be affected by mining:

(1) If a state assumes primary regulatory authority, the state shall designate an area as unsuitable for all or certain types of surface mining operations if the state determines that reclamation to the requirements of this Act is not technologically and economically feasible (Section 522(a)(2)).

(2) A surface area may be designated unsuitable for certain types of surface coal mining operations if such operations will affect renewable resource lands in which such operations could result in a substantial loss or reduction of long-range productivity of food or fiber products (Section 522(a)(3)(C). Any person having an interest which is or may be adversely affected shall have the right to petition the regulatory authority to have an area designated as unsuitable or to have such a designation terminated.

(3) The Secretary of the Interior shall conduct a review of the Federal lands to determine the presence of areas which are unsuitable for all or certain types of coal mining operations (Section 522(b)) pursuant to the standards set in Sections 522(a)(2) and 522(a)(3)(C)).

In order to accomplish the President's directive to develop specific standards for evaluating Federal lands to allow leasing only in those areas where mining is environmentally acceptable (Environmental Message of the President, May 23, 1977), the Assistant Secretary for Land and Water Resources directed that Coal Task Force 2 develop possible criteria for designating lands as suitable or unsuitable for coal leasing by the Department of Interior (U.S. Department of the Interior, 1978eeee). The task force membership was comprised of representatives from: (1) Bureau of Land Management, (2) U.S. Geological Survey, (3) Office of Surface Mining, (4) Fish and Wildlife Service, (5) Bureau of Indian Affairs, (6) Office of Economic Analysis, (7) Office of the Assistant Secretary - Land and Water Resources, and (8) the U.S. Forest Service. Coal Task Force 2 proposed two options for the prime farmland criterion:

(1) Federal lands that are identified as prime farmlands are significant to the Nation's agricultural productivity and the risk of mining and reclaiming these areas is too great so they shall be excluded from the competitive coal leasing program, or

(2) Federal lands that are identified as prime farmlands are significant to the nation's agricultural productivity, and pending a demonstration of reclamation success within major climate or precipitation zones, lands within these zones shall be excluded from competitive coal leasing.

A majority of the Task Force members preferred the option which would not preclude leasing on prime farmlands but which would shift the burden to the lessee for demonstrating that the lands can be successfully reclaimed to the standards in the Surface Mining Control and Reclamation Act (U.S. Department of Interior, 1978eeee).

6.1.5.2 Competition for Labor. Coal development will result in increased levels of competition for productive resources such as land, labor and capital. As labor is drawn away from the non-coal sectors, primarily agriculture and ranching in the western coal regions, production costs in these sectors will rise. Although some farm labor can be replaced by machines, the total cost per unit in farm production will increase.

Projected increases in coal development and conversion in the western coal regions will produce the competitive phenomenon described above. In the use of the western coal regions, most of the agricultural labor force is male. If new industry hires are predominantly men, the change in labor supply available and wage rate will have a greater impact on farm organization than if women are hired. Another important variable is the extent to which the industry relies on the local labor market rather than bringing workers with previous experience from outside the local area. In any case, the effects will differ between farms based on their size and the kind of products they produce.

Operators of small farms who have been underemployed in their farm businesses may take advantage of the new off-farm job opportunities that industry provides. Some of these operators may continue to operate their farms on a part-time basis, while others may leave agriculture entirely.

Operators who are fully employed with adequate incomes from farming and who do not hire much extra labor will be affected least by

labor market changes. They likely will not be attracted to off-farm work and higher wages for hired labor will have little effect on their operations. Finally, those operating large farms and ranches and hiring large amounts of labor will be likely to make significant adjustments in their operations. These adjustments will likely include dropping certain labor-intensive enterprises, adopting labor-saving technologies, and perhaps even reducing the size of their farming operation. Those agricultural operations with highly seasonal labor demands may experience significant labor shortages. These shortages may be translated into increased price levels for agricultural products.

The potential impact of industrial development on the availability of agricultural labor will depend upon the type of workers required by industry. It appears likely that strip mining may compete quite directly with agriculture for labor as both industries place a premium on men in their physical prime who are accustomed to working with machinery and to working long hours outdoors.*

Once commercial development occurs to accomodate demands generated by increased population levels, merchants will also probably face increased labor costs. Because wage rates associated with coal development are apt to be higher than prevailing wages in the area and because an overall scarcity of labor in the boom areas may cause all businessmen to bid up the price of labor, there is likely to be

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*This section was developed from material contained in: "Energy Resources Development in The Great Plains - A Summary of Economic Impacts.

a rapid turnover of labor in the commercial sector and a rising wage level as workers move from job to job, taking advantage of the opportunities open to them. These increased labor costs may be partially or fully offset by increases in the prices of the commodities supplied by the commercial sector. In general, increases in the prices for various goods and services will impose losses on consumers of these commodities. These individuals will be compensated to the extent that prices of goods for which they are net suppliers also increase.

6.1.5.3 Water Availability and Use

Problems and issues concerning water are among the most visible and politically intense of all those associated with energy development. The specific water problems and issues of coal mining and its related activities are site-dependent. Generally, however, these issues are associated with management of the water resource, both with respect to quantity and quality.

Coal mining places a variety of stresses on the natural conditions of the hydrologic system. This natural system can withstand stress within limits, but beyond those limits, the availability and quality of surface and ground water may be significantly affected. These effects may appear immediately or go undetected for long periods of time.

Allocation of surface water in non-navigable streams and ground water is normally controlled by individual states. In the eastern and midwestern coal regions, surface water is available in excess of

the current needs of those areas. Water availability in the western and southwestern coal regions is limited and in most of the areas available water is already allocated.

In the eastern coal regions, the major user of water is industry. Water is used in the manufacturing process or to transport wastes away from the manufacturing site. Large metropolitan areas rely heavily on available surface water. Although surface water is plentiful in the east, it is not evenly distributed across the region, thus water-short areas exist.

Agricultural water use increases to the west where the average annual precipitation levels are not sufficient to support highly productive agricultural operations. Both surface water and ground water are used to meet the demands of irrigation.

Coal mining affects water availability in two ways: (1) interference with ground water migration, (2) increased demands for available supplies, and (3) removal or relocation of available supplies. Increased demand may be the most visible of all water issues. The mining, cleaning, transporting, and utilizing of coal depend on a constant and relatively large supply of water. As already mentioned, most of the available water in the western states has already been appropriated to meet existing water needs. To meet some existing needs, interbasin transfer of water is used or is being proposed. Excess water from one basin is moved via pipeline to water-short areas. This transfer of water has caused significant political and emotional problems.

Even in the east where water is abundant, it may be limited in the immediate area of specific coal-mining operation. To meet this need, interbasin transfer of water may be necessary.

Coal mining may remove or relocate existing water supplies. Specifically, usable shallow aquifers can be drained and removed with the coal and overburden materials. Additionally, lowering of ground water levels around a mining operation can cause a change in ground water flow direction, thus affecting an existing well field. During reclamation, the natural recharge capacity of an area may be sufficiently altered to prevent replenishing of existing water supply aquifer systems. Similarly, coal mining affects existing surface-water supplies by removing existing drainage or diverting drainage to other subbasins.

Mining can affect the yearly distribution of surface flows. Flood potential may be increased during the high runoff season and base flow levels may be reduced during the dry season. The mean annual flow rate may remain the same, but the alteration of daily flow may affect most water users.

Mining activities may also affect the quality of water supplies. If a water source becomes significantly polluted, it may be removed as a source of supply for industrial, municipal, or agricultural needs.

Surface-water quality may be affected by acid-mine drainage, increased dissolved solids levels, and increased sediment loads. The source of acid-mine drainage may be the mine itself or waste and coal

storage piles. The low pH fluid can effectively destroy all life in surface streams. Acid-mine drainage problems will be greatest in areas producing high sulfur coal and having a general excess of available water.

High total dissolved solids (TDS) levels are normally associated with the low pH acid water. In addition to the major ionic components, fluid with high TDS levels may contain excessive levels of heavy and trace metals.

Runoff from active mines, unreclaimed mined areas, and waste and coal storage piles can contribute large volumes of sediment to surface water bodies. This could greatly increase the already heavy sediment loads found in most western rivers.

Ground water quality will also be affected by coal mining. Usable aquifers immediately below an active mine could be recharged by poorer quality water produced during the mining activity. Mine reclamation with waste material high in sulfur minerals could allow the recharge of acid waters to shallow ground water. Waste piles and ponds associated with the mining are potential sources of poor quality recharge to the ground water system. The lowering of the water level in some aquifers may induce the infiltration of polluted water from mine-affected streams.

All of the water quality issues discussed above have indirectly resulted from the mining/reclamation process. Water quality may also be affected by direct waste discharge to surface waters. The consumptive use of water during the coal mining and utilization activities

will increase the total dissolved solids in the water being used. Release of this effluent to streams will cause a deterioration of natural water quality. The use of sedimentation basins and ponds are alternatives to direct discharge. These facilities are required under the Federal Water Pollution Control Act. However, they may increase the threat of ground water pollution due to leaching of pollutants into ground water.

## 6.2 KEY PROGRAM ISSUES

### 6.2.1 Structure of the Coal Industry

The bituminous coal and lignite industry is characterized by thousands of companies and mines that are widely distributed in conformance with the pattern of the Nation's abundant coal resources. There are more than 6,000 mines representing approximately 4,000 companies, the specific numbers of which vary from year to year, as indicated below:

| Year | Number of Mines | Production (million tons) |
|---|---|---|
| 1950 | 9,429 | 516 |
| 1970 | 5,601 | 603 |
| 1975 | 6,168 | 648 |

Reduction in the number of mines over the years reflects the fact that large, modern new mines with highly sophisticated equipment are increasingly replacing older mines. Consolidating mines to increase operating efficiencies and hold down costs in the competitive energy market also has contributed to the decline.

The number and production of mines in 1975 have been aggregated by size-of-mine classifications and type of mining, as shown in Tables 6-5 and 6-6. Although the number of "small" mines was 69.6 percent of the total, they represent 10.3 percent (more than 67 million tons) of total production. Similarly, the intermediate group, 20.5 percent of total mines, accounted for almost 19 percent (more than 120 million tons) of total production.

TABLE 6-5

NUMBER AND PRODUCTION OF BITUMINOUS COAL AND LIGNITE MINES IN 1975, BY SIZE CLASSIFICATION AND TYPE OF MINING[a]

| Size Class (Thousand Tons) | Underground Mines | | | | Surface Mines | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | % of Grand Total | Production (Thousand Tons) | % of Grand Total | Number | % of Grand Total | Production (Thousand Tons) | % of Grand Total |
| Large | | | | | | | | |
| 500 and over | 163 | 7.1 | 162,581 | 55.5 | 121 | 3.1 | 196,704 | 55.3 |
| 200 - 499 | 193 | 8.4 | 60,824 | 20.8 | 134 | 3.5 | 40,809 | 11.5 |
| Total | 356 | 15.5 | 223,405 | 76.3 | 255 | 6.6 | 237,513 | 66.8 |
| Intermediate | | | | | | | | |
| 100 - 199 | 197 | 8.6 | 27,343 | 9.3 | 266 | 6.9 | 36,906 | 10.3 |
| 50 - 99 | 282 | 12.3 | 19,720 | 6.7 | 518 | 13.3 | 36,248 | 10.2 |
| Total | 479 | 20.9 | 47,063 | 16.0 | 784 | 20.2 | 73,154 | 20.5 |
| Small | | | | | | | | |
| 10 - 49 | 800 | 34.9 | 19,515 | 6.7 | 1,617 | 41.7 | 39,081 | 11.0 |
| Less than 10 | 657 | 28.7 | 2,842 | 1.0 | 1,220 | 31.5 | 5,864 | 1.7 |
| Total | 1,457 | 63.6 | 22,357 | 7.7 | 2,837 | 73.2 | 44,945 | 12.7 |
| Grand Total | 2,292 | 100.0 | 292,826 | 100.0 | 3,876 | 100.0 | 355,612 | 100.0 |

[a] "Coal-Bituminous and Lignite," Minerals Yearbook, Bureau of Mines, U. S. Department of the Interior

TABLE 6-6

NUMBER AND PRODUCTION OF BITUMINOUS COAL AND LIGNITE MINES IN 1975, BY SIZE CLASSIFICATION AND TYPE OF MINING[a]

| Size Class Thousand Tons | Mines | | Production | |
|---|---|---|---|---|
| | Number | % of Grand Total | Thousand Tons | % of Grand Total |
| Large | | | | |
| 500 and over | 284 | 4.6 | 359,284 | 55.4 |
| 200 - 499 | 327 | 5.3 | 101,633 | 15.7 |
| Total | 611 | 9.9 | 460,917 | 71.1 |
| Intermediate | | | | |
| 100 - 199 | 463 | 7.5 | 64,250 | 10.0 |
| 50 - 99 | 800 | 13.0 | 55,968 | 8.6 |
| Total | 1,263 | 20.5 | 120,218 | 18.6 |
| Small | | | | |
| 10 - 49 | 2,417 | 39.2 | 58,597 | 9.0 |
| Less than 10 | 1,877 | 30.4 | 8,706 | 1.3 |
| Total | 4,294 | 69.6 | 67,303 | 10.3 |
| Grand Total | 6,168 | 100.0 | 648,438 | 100.0 |

[a]"Coal-Bituminous and Lignite," Minerals Yearbook, Bureau of Mines, U.S. Department of the Interior

The small and intermediate size mines are very important components of the industry. In addition to adding to the highly competitive nature of the industry, they provide great flexibility for both large and small consumers in the open (spot) market in which long-term contracts are either nonexistent or less important than for large mines. Also, when energy supplies are low, spot prices rise considerably. Small mines have flexibility in meeting emergency energy demand because many can enter and exit the coal market without serious effects on their operating capabilities.

An indicated in Table 6-5 , large mines produce most of the Nation's coal. Although this category constitutes 4.6 percent of all mines, these large operations produced more than 55 percent of total National output (359 million tons) in 1975. When the largest mines are combined with those in the next largest category, it is clear that approximately 10 percent of the mines produced 71 percent of total coal tonnage (461 million tons).

The structure of the industry generally has been dictated by (1) the location, ownership, and quality of mineable reserves, (2) the nature and location of markets, (3) shifts in marketing patterns, and (4) both the near and long-term coal demands. The latter includes the potential impacts of government-perscribed environmental requirements.

Mines owned or controlled by large coal-consuming interests-- including the steel industry, electric utilities, and some private industrial companies-- are classified as "captive" operations. Also, mines and coal reserves are owned by oil, gas, and other energy companies

interested in market expansion as well as by diversified industrial interests anticipating the production of synthetic gas and liquid fuels from coal.

As competition from oil and natural gas increased substantially after World War II, the coal industry was forced to become highly mechanized and integrated to remain competitive. Technological alliances encouraged efficiency in mine operations and in overall management and marketing. Also, surface mining has expanded rapidly in recent years, reflecting generally lower costs. After gradual increases in surface mining for several decades, the upward trend accelerated sharply in 1970. As indicated in Table 6-2 , by 1975 there were more surface mines than underground mines (3,876 to 2,292) and surface mines production exceeded that of underground mines (355.6 million to 292.8 million tons).

The advances in mine mechanization, increased surface mining, and other changes in the industry largely were in response to oil and gas competition, which covered large segments of some coal markets. The industry lost its 133 million-ton market for railroad fuel when diesel fuel replaced coal in modern trains. Other serious reductions occurred in the household and commercial markets as oil and gas replaced coal for space heating and other purposes. These and other factors seriously influenced the nature of the industry, which also, and conversely, was strongly affected by the enormous growth in coal-fired electric power generation.

In addition to the changes these developments brought to the structure of the coal industry, it is still changing and will continue to do so as it adjusts to developments in the Nation's overall energy structure. These adjustment factors include continually changing patterns in the markets for coal and revisions in governmental laws, rules, and regulations.

As these developments occur greater concentration of reserves and production into large companies will probably result. Because of the large financial investments involved, and restrictive problems in meeting governmental requirements, it is likely that large companies will undertake most new mining development because of the costs and time involved.

The coal industry initially developed and expanded in the large coal reserves east of the Mississippi River, served the large industrial, space heating, and commercial markets of this area.

Coal reserves west of the Mississippi River are greater (57 percent of national resources) than in the East, however, but until relatively recently, western coal production was limited primarily to western or nearby markets. Western coals differ from eastern coals in several respects. With some exceptions, production in the West generally is of lesser rank than eastern coals, but western coals are preponderantly of low sulfur content. This is a very important characteristic in regard to government-mandated requirements to reduce sulfur in coal and in stack gas emissions following its combustion.

While coal reserves in the East are practically all privately owned, reserves in the major coal producing states of the West are usually owned by the Federal government. Many existing Federal leases, both currently producing and nonproducing, are held by large national and other mining companies with demonstrated ability to develop and operate mines. Some leases, however, are held for future conversion of enormous quantities of coal into synthetic gaseous and liquid fuels.

Most western low sulfur coals are produced by low cost surface mining. This accounts, in large part, for commitments for new coal-fired electric power generating units in the West, and in some eastern markets. As recently reported by the Federal Energy Regulatory Commission, Department of Energy, 161.4 million tons of coal will be required for these new units through 1981, and, cumulatively, 235.4 million tons through 1986. For most of this coal there already are firm contracts for western coal.

An indication of accelerating coal production in the West is the increased production in selected years, in the six major coal-lease states (Colorado, Montana, New Mexico, North Dakota, Utah, and Wyoming) as shown below (in millions of tons):

| Year | Tons |
|---|---|
| 1971 | 39.3 |
| 1973 | 53.0 |
| 1975 | 78.3 |
| 1976 | 95.3 |
| 1977 preliminary | 118.4 |

Coal production from Federal leases increased from 12.9 million tons in 1973 to 38 million tons in 1976.

Large increases in new mining capacity have been reported under development or planned in the West. Recent forecasts project very large demands for western coal in 1985 and 1990.

From these developments it appears that a new era in coal production and utilization is under way that could strongly affect the future structure of the coal industry. Whatever magnitude new western coal production will attain it is likely, as a matter of economics, that most of it will be produced by large companies and mines that can afford the huge financial investments and long lead times involved.

6.2.1.1 Technology Changes

New Extraction Techniques. Experimentation is proceeding on several new techniques for coal removal or deriving energy from coal. Although none of the techniques has advanced sufficiently to be used today for producing coal, they should be considered as potential means for future production.

Industry and government have developed remote control techniques that may be adapted by the mining industry to make underground mining completely automated. Another new process involves fracturing coal seams hydraulically and flushing the solid coal to the surface. With both of these techniques, the coal would brought to the surface in its natural form, that is with its ash and sulfur content intact.

Today, research is centering on other techniques of mining, such as the long wall-auger miner, and the bore hole method. The long wall-auger miner combines the better characteristics of long wall mining with those of auger mining to increase the production efficiency. In the bore hole mining technique, a cylindrical unit containing a high pressure hose with two nozzles is lowered down a bore hole to swivel around and erode and wash the coal out. The coal slurry runs into a sump and is pumped up to the surface where coal separation takes place by settling. The water is reused .

Because contour strip mines disturb large surface areas, Federal state, and private agencies are developing new ways to minimize the adverse effects of this mining method. Slope reduction, box-cut,

lead of hollow fill, and pit storage are being refined as more experience with varying conditions is developed. As an example, two of the slope reduction methods, the 7°-storage angle and the parallel fill, were developed on the theory that by reducing the weight on the fill bench and spreading the spoil over a large area it would be less likely to slide. The procedure used to recover the coal and rehabilitate the land by the 7°-storage angle method is described in Figures 6-1 through 6-3 (Grimm and Hill, 1972).

The parallel fill method is a modification of the 7°-storage angle method. Overburden is pushed down the slope and compacted in 3-foot layers at the same angle as the original slope. The depth of the fill is determined according to the degree of original slope. Although parallel fill is still in the experimental stage, it may prove to be more successful than the 7°-storage angle method because slides have not occurred where it has been tried.

The pit storage method is yet another application where a block of overburden is removed and disposed of by one of the slope reduction methods. An original cut is made into the hillside to the maximum width that is to be contour mined. The length, along the hillside, is generally three times as long as that of the following cuts. After the coal is removed, the overburden from the second cut is placed in the first pit and the coal from the second cut is removed. This process is repeated as mining progresses around the mountain. Once the original cut has been made, mining can be continuous, working in both directions

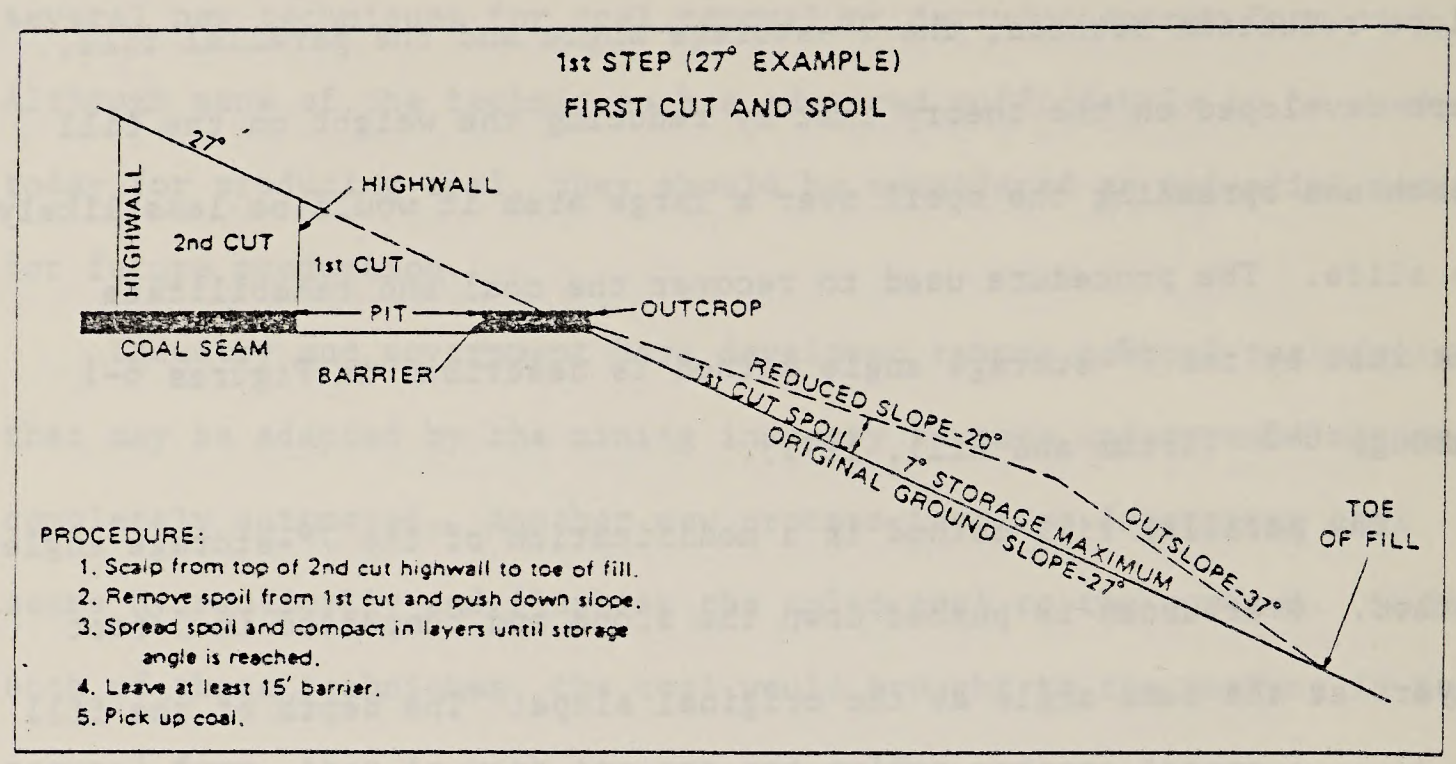



Figure 6-1. First step (27° example) first cut and spoil.

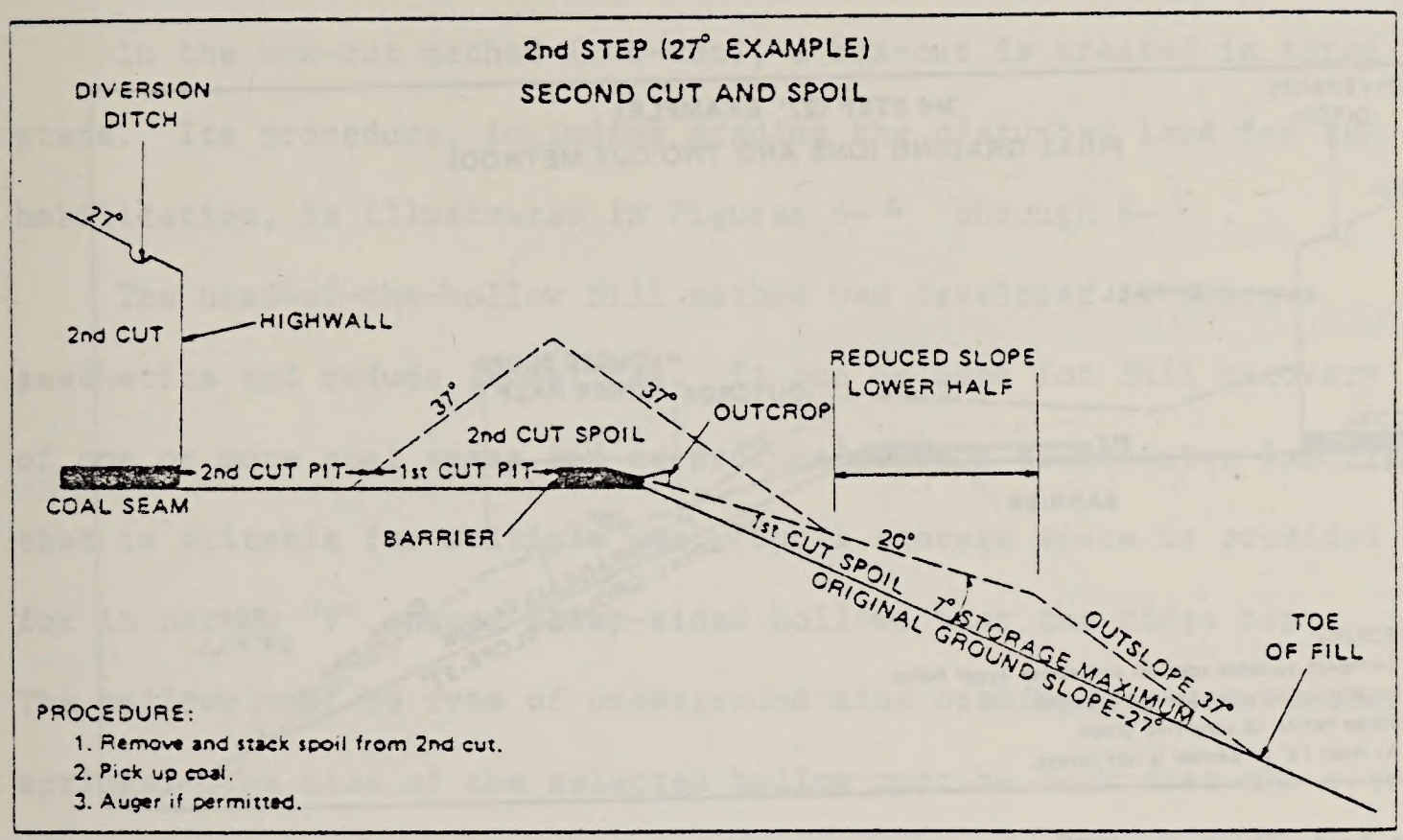



Figure 6-2 Second step (27° example) second cut and spoil.

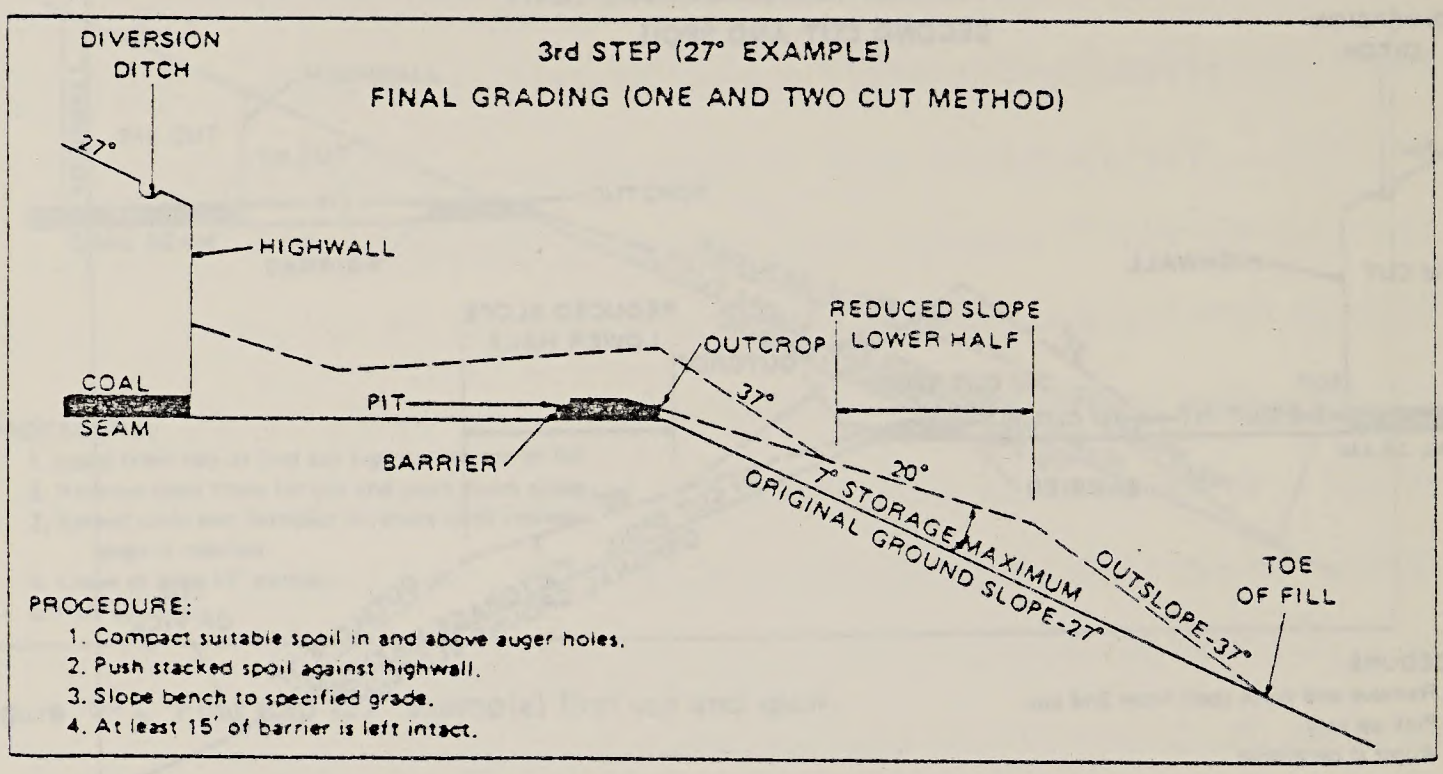



Figure 6-3 Third step (27° example) Final grading (one and two cut method).

from cut number one. This method places little overburden on the original slope and allows the operator to mine a maximum width bench with optimal coal recovery. Grading to the approximate original contour is thus, cheaper, and the potential for slides is minimized.

In the box-cut method (two-cut), a box-cut is created in three steps. Its procedure, including grading the disturbed land for rehabilitation, is illustrated in Figures 6-4 through 6-7 .

The head-of-the-hollow fill method was developed to improve aesthetics and reduce landslides. It can be used for full recovery of one or more coal seams and to produce rolling mountaintop land that is suitable for multiple use. Spoil storage space is provided for in narrow "V" shaped steep-sided hollows near the ridge top. The hollows must be free of underground mine openings or wet weather springs. The size of the selected hollow must be such that the overburden generated by the mining operation will completely fill it. The procedure for placing the spoil in the hollow is:

- Scalp entire area that will be covered with fill;
- Construct french drains in the hollow water courses;
- Build the fill in compacted layers; face of fill no steeper than 2:1;
- Construct crowned terraces every 20 feet, approximately 20 feet wide;
- Center of complete fill bench is crowned toward the highwall so that water will flow onto excavated benches;
- Build silt control structures below hollow fill.

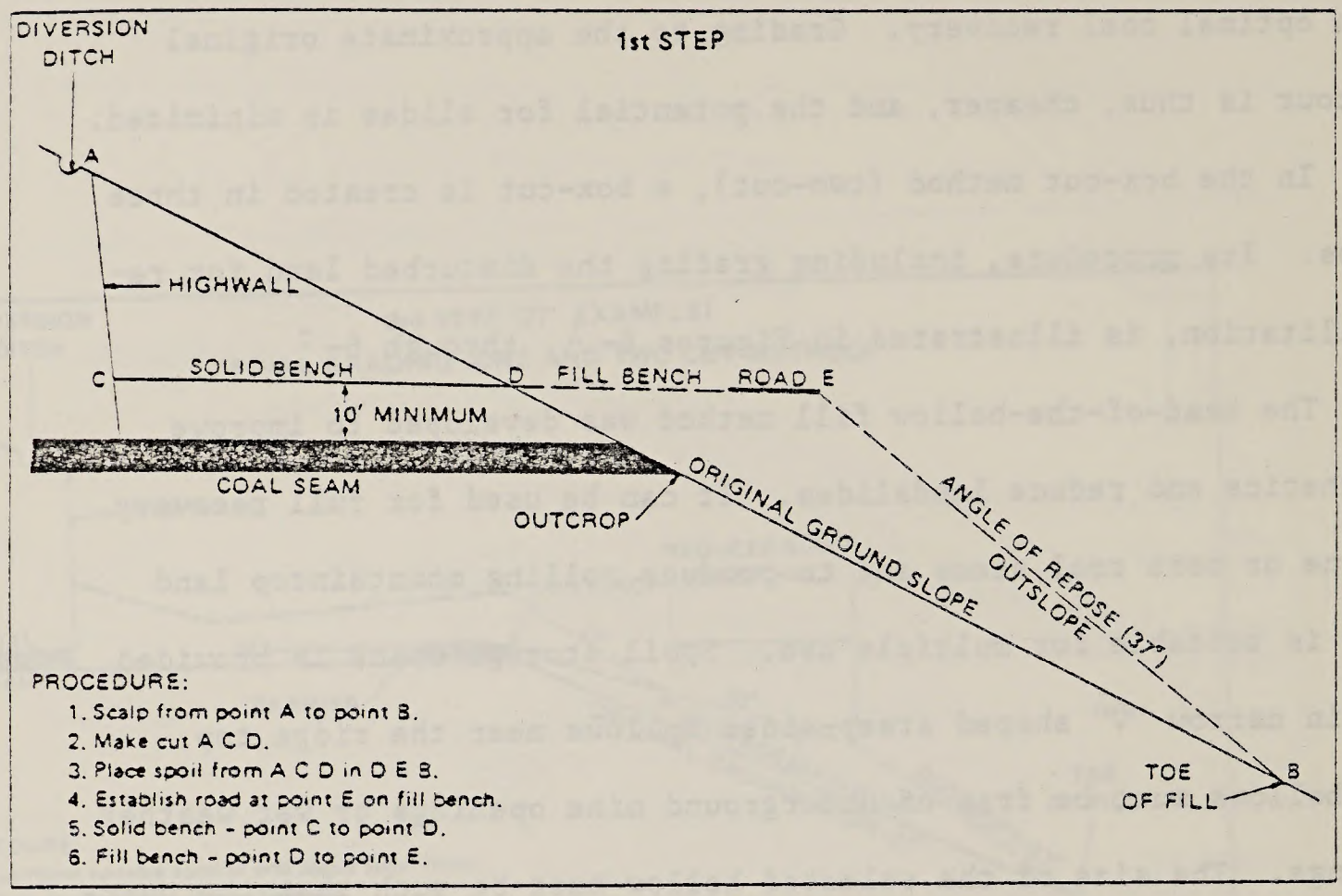



Figure 6-4 First step box-cut method (two-cut).

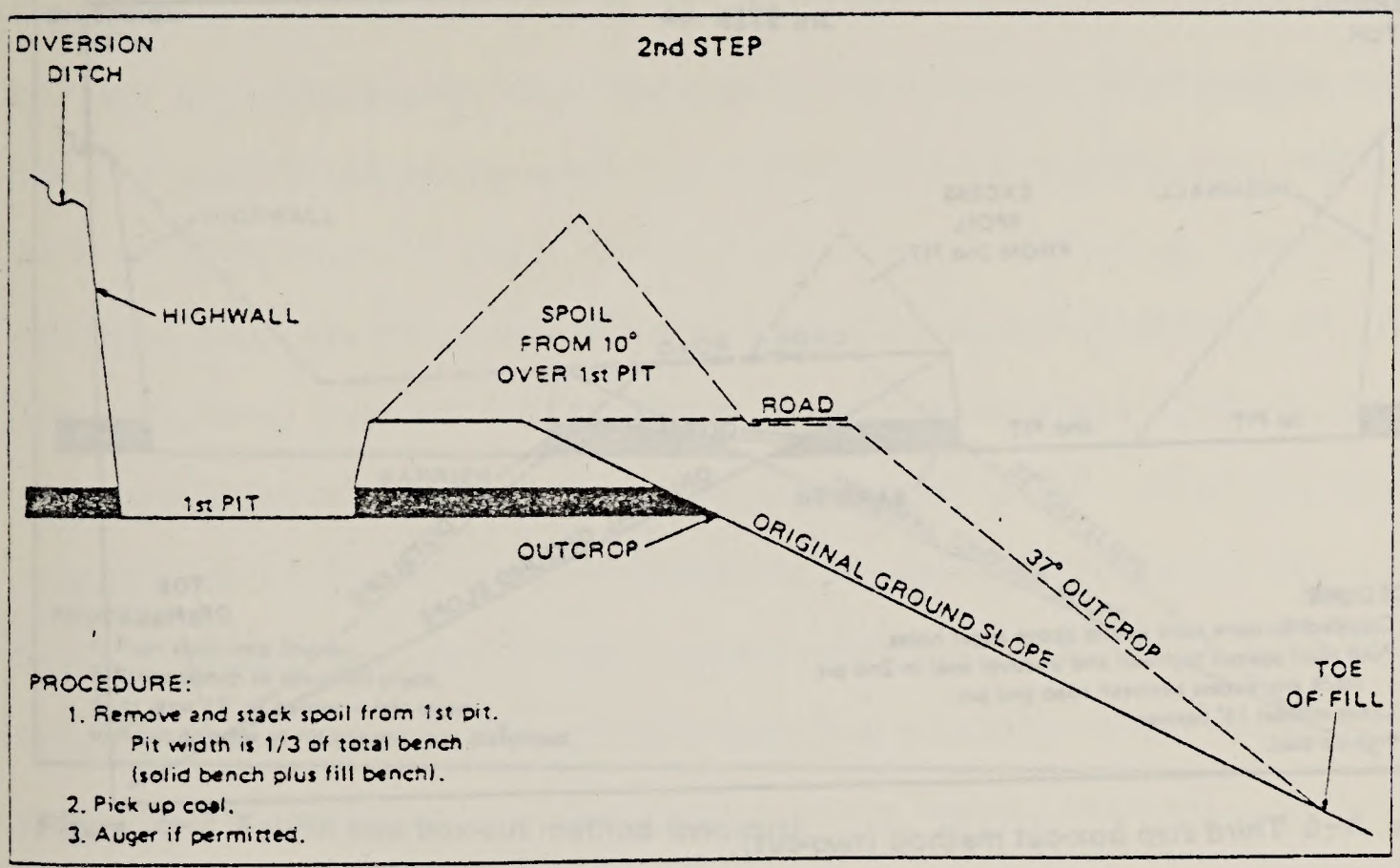



Figure 6-5 Second step box-cut method (two-cut).

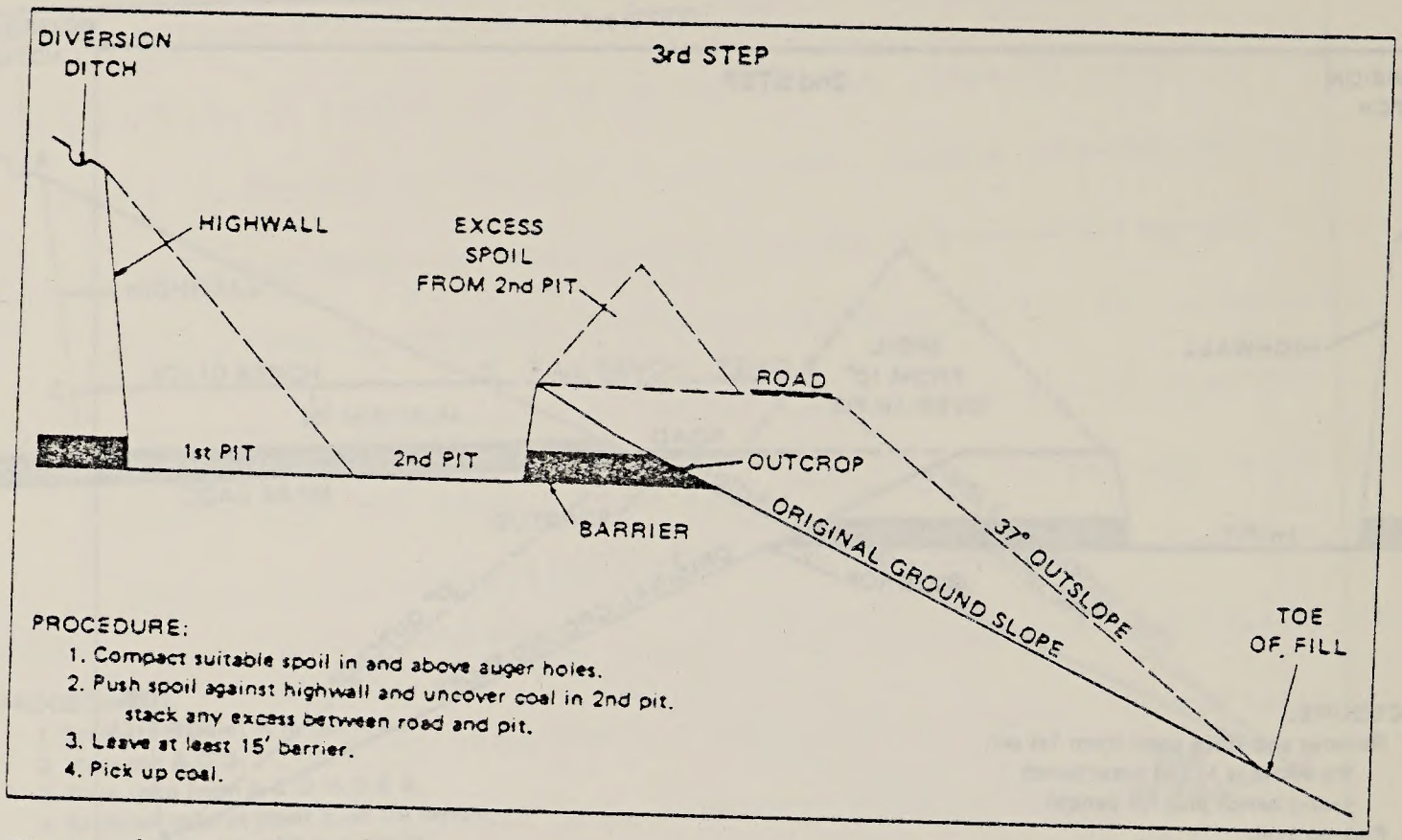



Figure 6-6 Third step box-cut method (two-cut).

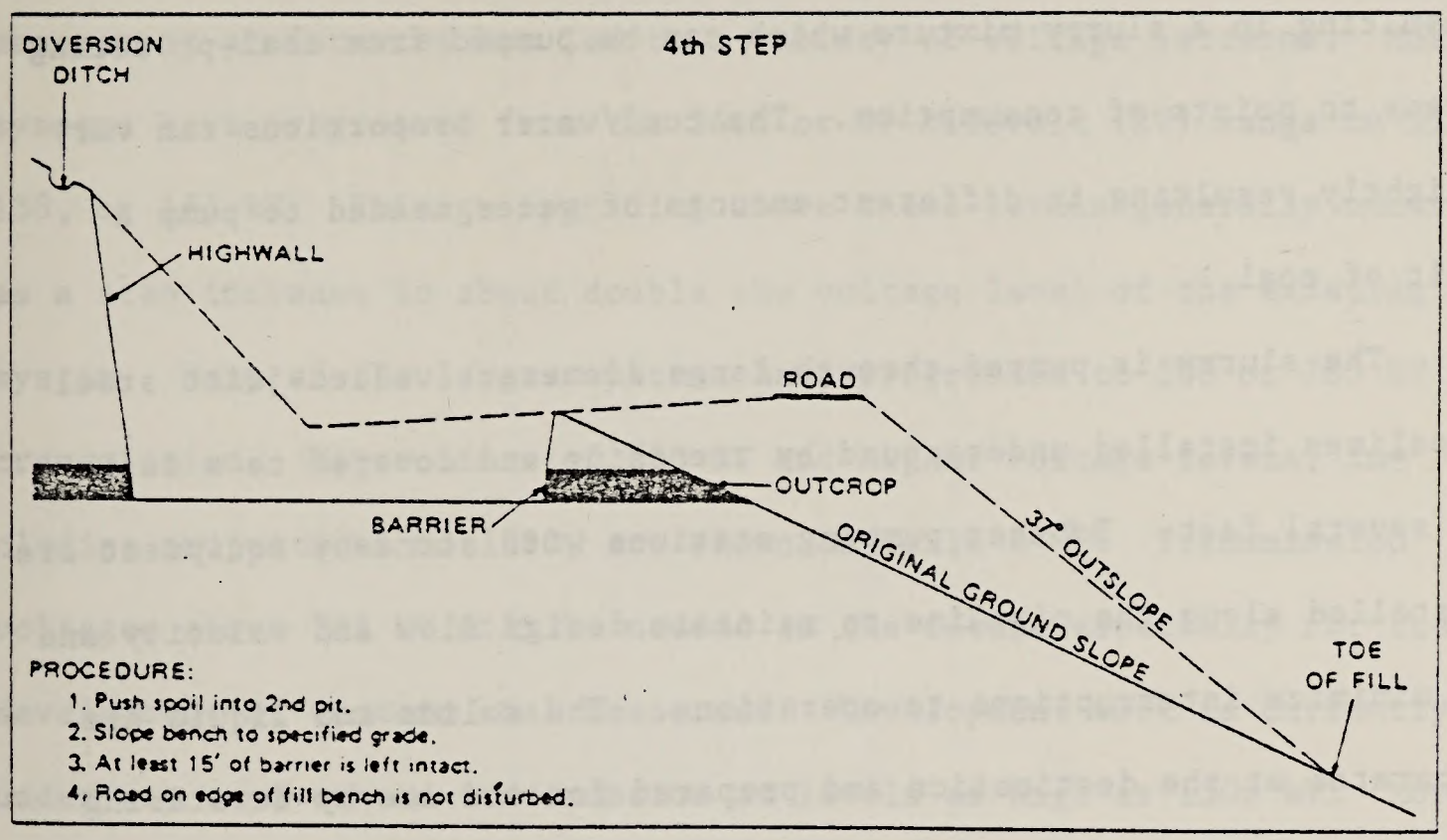



Figure 6-7 Fourth step box-cut method (two-cut).

Slurry Pipelines. Another technological innovation is now used in certain areas of the country. This technology consists of the use of finely powdered coal mixed with water, about 50 percent by weight, resulting in a slurry mixture which can be pumped from coal-producing areas to points of consumption. The coal/water proportions can vary slightly resulting in different amounts of water needed to pump a unit of coal.

The slurry is pumped through large diameter, welded-joint steel pipelines installed underground by trenching and covered to a depth of several feet. Booster pumping stations with stand-by equipment are installed along the pipeline to maintain design flow and velocity and to minimize interruptions to operations. The solids and liquid are separated at the destination and prepared for end use by dewatering processes. The clean water goes to the power plant cooling water system.

An important consideration in locating the pipeline is to choose a route where the slope of the pipeline is less than 16 degrees; this prevents clogging by settling of solids during shutdown. In some places, it may be necessary to make deep trenching cuts or provide additional switchbacks in order to meet this requirement.

A number of other considerations are also involved in the design of the pipeline and related facilities. These include slurry viscosity, flow velocity, coal powder size distribution, mixing ratio, coal properties, pressure drops, system reliability, and other more complex design criteria (Aude et al., 1971).

Transmission Voltage Levels. Transmission voltage levels have increased in keeping with load growth. The evolution of power systems with various historical origins, load densities, growth rates, and management preferences has led to a variety of voltage patterns. Most systems have progressed from the 34.5 or 69 kilovolt (kV) range to 115, 138, or 161 kV. Voltage upgrading above these levels generally occurs as a step increase to about double the voltage level of the existing system. Many of the larger systems have progressed to 500 or 765 kV transmission. Major lines of 230 kV and higher voltage levels, including projections to 1990, are shown in Table 6-7. Transmission voltages above 765 kV will be needed in the future especially for the development of western coal resources. Development work is currently under way on overhead transmission at levels as high as 1500 kV. More research is needed to provide information on behavior of long air gaps and insulation media and on ways to reduce switching surges and corona effects before practical installations will be possible at voltages of 1000 kV and above.

High-Voltage DC Transmission. High-voltage direct current transmission has not been used extensively up to this time, although worldwide there are a number of applications including one in the western United States.

Underground Transmission. An alternative to the overhead transmission of electricity is to carry the current through underground wires. This approach has met with success regarding the distribution of electricity over short distances such as in residential areas, where

Table 6-7

Transmission Line Mileages in U.S., 230 kV and Above[1]

| | 230 kV | 287 kV | 345 kV | 500 kV | 765 kV | ±400 kV(dc) | Total |
|---|---|---|---|---|---|---|---|
| 1910..... | 2,327 | 647 | ..... | | | | 2,974 |
| 1950..... | 7,383 | 791 | ..... | | | | 8,174 |
| 1960..... | 18,701 | 1,024 | 2,641 | 13 | ..... | | 22,379 |
| 1970..... | 40,600 | 1,020 | 15,180 | 7,220 | 500 | 850 | 65,370 |
| 1980..... | 59,560 | 870 | 32,670 | 20,180 | 3,540 | 1,670 | 118,490 |
| 1990..... | 67,180 | 560 | 47,450 | 33,400 | 8,940 | 1,670 | 159,200 |

[1] By 1990 there may be significant applications of ac voltages higher than 765 kV and more extensive use of HVDC than that shown in the table.

the aesthetic intrusion of overhead wires is in important factor. However, because of the line losses of underground wires unless expensive, but not fully developed, cryogenic systems are used, underground transmission over long distances is not yet practical.

A major difficulty of underground alternating current transmission lines is the continuous flow of so-called "charging current" between the conductor and the sheath. Its magnitude increases with voltage and varies inversely with the thickness of the insulation and directly with the length of the cable. At 345 kV, utilizing commercially available cable, practically all of the current-carrying capability of the uncompensated underground conductor is utilized by this charging current in a distance of about 26 miles. Therefore, no capability is left for useful current to be transmitted, unless very expensive and bulky compensation is installed.

New Coal Use Technology. It is certain that the technology of coal use is going to change drastically in the future. The new technology will include converting coal to liquid and gaseous fuels by both surface and in situ processing, improving direct combustion of coal and developing advanced power conversion systems including fuel cells and magnetohydrodynamics. (For further information, see Appendix ).

6.2.2 RELATIONSHIP OF COAL TO OTHER INDUSTRIES AND CONSUMER

6.2.2.1 Impacts on Transportation Industry

Industry. Growth in western coal production will far overshadow growth rates in other regions. Growth rates by region can be approximated using the Department of Energy's 1985 mid-level scenario as illustrated below:

| | National Coal Production (millions of tons) | | |
|---|---|---|---|
| Region | 1975 | 1985 | % Growth |
| Appalachia | 396.3 | 440.6 | 11.1% |
| Midwest | 141.0 | 204.4 | 45.0% |
| Total East | 537.3 | 645.0 | 20.0% |
| Northern Great Plains | 54.8 | 327.5 | 497.6% |
| Rest of the West | 55.3 | 144.8 | 161.8% |
| Total West | 110.1 | 472.3 | 329.0% |
| Total U.S. | 647.4 | 1117.0 | 72.5% |

Source: Department of Energy, Leasing Policy Development Office, Draft, Federal Coal Leasing and 1985 and 1990 Regional Coal Production Forecasts, June 1978.

Rail Capacity

What these growth rates portend for the transportation industry (particularly the western states) is not altogether clear. It appears however, that if coal demand reaches the levels presented in the National Energy Plan, there will be at least localized transportation capacity problems. Figure 6-8 indicates locations where rail capacity may, according to preliminary estimates, be insufficient for 1985 levels. Those sections of the rail network that may be overcapacitated are:

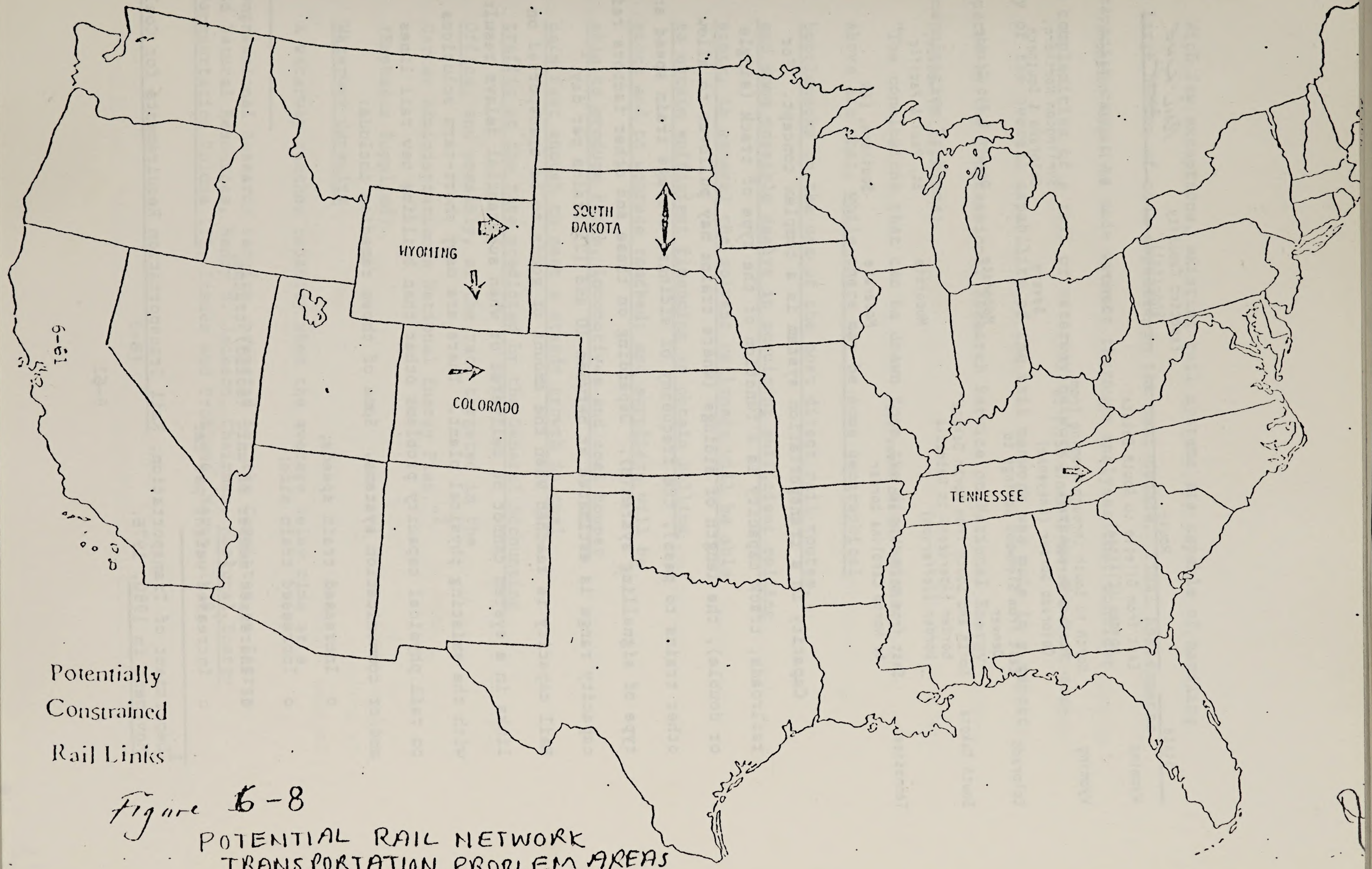



Figure 6-8

POTENTIAL RAIL NETWORK TRANSPORTATION PROBLEM AREAS

| State | Route | Expected Capacity Shortfall | RAIL LINE ~~2000~~ |
|---|---|---|---|
| Wyoming | East from Gilette to South Dakota border (Clifton) | Severe | Burlington Northern |
| Wyoming | North to South through Wyoming from Montana border (Frannie Jct.) to Colorado border (Cheyenne) | Severe | Burlington Northern, Colorado & Southern |
| Colorado | East from Glenwood Springs to Denver | Moderate | Denver & Rio Grande |
| South Dakota | North and South from North Dakota border (Aberdeen) to Nebraska border (Jefferson) | Moderate | Chicago, Milwaukee, St. Paul & Pacific |
| Tennessee | East from Nashville and Knoxville to North Carolina border | Moderate | Southern, L&N |

Capacity in a transportation system is a complex concept. For railroads, track capacity is a function of the type of track (single or double), the length of sidings (where trains may pullover to allow other trains to pass), the frequency of sidings, average train speed and type of signalling system(s). Depending on these and other factors rail capacity range is estimated at between 10 and 125 trains per day.[1] Rail capacity is reached when the amount of goods to be transported on links in a system cannot be delivered or when substantial delays result with the existing physical plant. There are many short-term solutions to rail physical capacity problems other than building new rail lines and/or communication systems. Some of those remedies include:

- o Increased train speeds;
- o Increased train size;
- o Increased number of unit (solid) trains;
- o Increased weight per car

[1] Department of Transportation, Rail Transportation Requirements for Coal Movement in 1980, 1976.

With few exceptions, existing rail systems are capable of handling the large burden of coal expected in the next decade. Final assessments of capacity cannot be made without thorough analyses that consider the complexities of a rail or waterway network. Perhaps the best summary of the overall capability of the rail network was made in a report prepared by the Congressional Research Service on National Energy Transportation Problems:

> "The conclusions that can be drawn from the discussions above are that, while there may be some geographical bottlenecks to the use of the most direct rail routes, and some possible dealys in acquiring sufficient rolling stock, in general the solvent railroads will be able to obtain sufficient financing to obtain rolling stock and to upgrade roadbed; and suppliers will be able to produce rails, locomotives and coal hopper cars fast enough to meet a steady growth in coal traffic at the rate predicted by the General Accounting Office, and possibly, at the rate targeted in the Carter Administration's National Energy Plan."[2]
>
> (Emphasis Supplied)

Waterway Capacity

A waterway reaches capacity when the average delay time at a

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[2] Congressional Research Service, prepared for the Committee on Energy and Natural Resources, Henry M. Jackson, Chairman, National Energy Transportation Volume III, Issues and Problems, March, 1978.

lock exceeds 150 minutes.* There is little doubt that severe capacity problems already exist in the waterway system and, until the question of waterway user charges is solved, it is unlikely that any new major construction programs will be authorized. The most serious delays at inland waterway locks occur where lock capacity is close to or exceeds design capacity levels. Locks already exceeding or close to exceeding designed capacity include:

- o Locks 50 to 53 on the Ohio River;
- o Locks 26 and 27 on the Upper Mississippi;
- o All locks on the Illinois River system.

Corps of Engineers data indicate that most of the locks on the Illinois River currently exceed or will surpass capacity in the near future. The following presents their estimates.

INLAND NAVIGATION FACILITIES CAPACITY, 1970 TONNAGE AND PROJECTED TONNAGE 1980-2000

| Lock | Designed Capacity | 1970 Tonnage | Estimated Tonnage | | |
|---|---|---|---|---|---|
| | | | 1980 | 1990 | 2000 |
| | | (millions of tons) | | | |
| Lockport | 22.4 | 22.9 | 32.0 | 37.5 | 43.1 |
| Brandon Road | 23.1 | 23.5 | 30.6 | 27.9 | 45.1 |
| Dresden Island | 33.1 | 25.3 | 33.2 | 42.1 | 49.6 |
| Marsailles | 29.7 | 24.2 | 30.8 | 41.0 | 47.3 |
| Starved Rock | 42.6 | 25.5 | 31.8 | 41.8 | 48.2 |
| Peoria | 54.2 | 29.0 | 40.1 | 51.9 | 63.2 |
| La Grange | 52.1 | 26.0 | 37.9 | 49.2 | 62.6 |

Source: General Accounting Office, Report to the Contress, Factors to Be Considered in Setting Future Policy for Use of Inland Waterways, 1975.

*U.S. General Accounting Office, Report to the Congress, Factors to Be Considered in Setting Future Policy for Use of Inland Waterways, 1975.

It is clear that substantial problems will exist on the Illinois system as early as 1980. One result of those existing and potential bottlenecks is that new coal shipments will be hampered when transported between:

- The Upper and Lower Mississippi;
- The Illinois River and Upper Mississippi;
- The Illinois River and Mississippi River;
- The Ohio River to or from the Cumberland, Tennessee or Mississippi Rivers

Local Road and Highway Systems

Substantial problems in the local highway and road system are anticipated even with moderate increases in coal traffic. Section 153 of the Federal Highway Act of 1976 requires that highway needs for energy-related traffic be identified and that cost estimates of those needs be forecast through 1985. A study complying with Section 153 determined that approximately 7.3 billion dollars will be rquired between 1970 and 1985 to build or rebuild roads utilized for coal hauling.* The Appalachian Region alone accounts for 6.4 billion or 88 percent of the total. Ten states in the study were also determined to have had a 4.1 billion dollar backlog of needed reconstruction/restoration projects. The bulk of those states are in the Appalachian area.*

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*Department of Transportation, Transporting the Nation's Coal - A Preliminary Assessment, January 1978.

If the proposed Environmental Protection Agency (EPA) regulations concerning pollution control make western coal less uneconomical vis-a-vis eastern coal, the potential for substantial and widespread capacity problems in the eastern highway/roadway network will be significantly increased. Most of the western coal that is likely to be mined will move either by rail or slurry pipeline with a very small portion moving by truck in mine-to-market operations.

Equipment

Availability of coal transportation equipment is equally as important as having sufficient trackage, road mileage, and waterway lock capacity. In 1973, there were 2,293 tow boats and 14,904 dry cargo barges for a ratio of 6.5 dry cargo barges per tow boat.* Data from the Association of American Railroads indicates there were 27,680 locomotives available in 1977 and approximately 360,000 hopper cars. Table 6-8 presents data on net open hopper capacity by ownership for the year 1975, showing the principal hopper owning railroads for that year. Also presented in Table 6-9 are data concerning amounts of coal hauled by railroad and revenue attirbutable to coal transport by rail.

Future Equipment Needs

Given the large increases in coal traffic expected in the 1977-1985 period, the question of equipment availability assumes major significance.

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* Bureau of Mines, Information Circular 8706 - Coal Transportation Practices and Equipment Requirements to 1985, 1976.

TABLE 6-8

TO BE PROVIDED

TABLE 6-5

PRINCIPAL COAL-HAULING ROADS-STATISTICAL DATA

| Railroad (Ranked In order of Amounts of Coal Carried, 1971) | Bituminous Carried Coal, 1975 (millions of tons) | Coal Originated 1975 (millions of tons) | Open Top Coal Hopper Fleet as of 1/1/74 (% of total) (thousands of cars) | Total Operating Revenues, 1975 1/ (millions of dollars) | Revenues from Coal Shipments 1/ 1975 (millions of dollars) |
|---|---|---|---|---|---|
| 1. Norfolk and Western | 77.9 | 67.3 | 55.4 (17%) | 985 | 408 |
| 2. Penn Central | 74.2 | 41.9 | 44.6 (13%) | 2,175 | 277 |
| 3. Chesapeake and Ohio | 59.1 | 48.1 | 46.3 (13%) | 572 | 258 |
| 4. Louisville and Nashville | 58.4 | 52.3 | 33.2 (9%) | 589 | 173 |
| 5. Baltimore and Ohio | 43.9 | 25.4 | 23.9 (6%) | 614 | 169 |
| 6. Burlington Northern | 38.9 | 36.2 | 11.1 (4%) | 1,320 | 209 |
| 7. Southern | 35.5 | 26.0 | 10.7 (3%) | 864 | 103 |
| 8. Illinois Central Gulf | 25.5 | 21.9 | 10.9 (3%) | 547 | 68 |
| 9. Chicago and North Western | 16.0 | 3.7 | 4.0 (1%) | 459 | 40 |
| 10. Seaboard Coast Line | 15.5 | .1 | -- | 637 | 33 |
| 11. Union Pacific | 15.4 | 12.4 | 7.7 (2%) | 992 | 81 |
| 12. Clinchfield | 13.3 | 7.3 | 4.2 (1%) | 45 | 26 |
| 13. Denver and Rio Grande Western | 13.0 | 10.9 | 2.6 (1%) | 148 | 36 |
| 14. Elgin, Joliet, and Eastern | 12.6 | .0 | -- | 80 | 16 |
| 15. Missouri Pacific | 12.4 | 10.4 | 6.3 | 631 | 25 |
| Total of Average of Largest 15 | 511.6 1/ | 363.9 | 260.9 | 10,658 | 1,932 |
| % of All Class I, If Relevant | 85% | 90% | 76% | 65% | |
| TOTAL ALL Class I | 604.3 1/ | 405.0 | 342.4 | 16,279 | 2,127 |

Source: Congressional Research Service, National Energy Transportation, Volume I, May, 1977.

1/ Include duplications.

Table 6-10 compares various demand scenarios and the respective equipment required to accomplish movement of varying levels of coal production. There appear to be few problems in meeting anticipated equipment needs in the freight car industry. The freight car industry is estimated to have over 50 percent excess capacity relative to meeting equipment retirement needs. The industry expects no foreseeable problems in delivering increased equipment for coal requirements.[7]

Barge equipment needs also appear to present few problems for the forecast period. Manalytics Inc., in their study for the Electric Power Research Institute, estimate barge producers can produce coal-dedicated equipment with the capacity to handle over 250,000,000 tons annually during the next decade.[8] Truck manufacturing capacity through the forecast period appear to be sufficient to meet future growth needs for truck transported coal. At present manufacturers are operating at approximately 70 percent of production capacity.[9]

Based upon the preceeding, it is apparent that aside from specific rail and waterway transport links identified as insufficient for propjected traffic levels, the existing network of transport facilities will be adequate. Further, it appears that producers of transport vehicles will not experience major problems in meeting demand for additional rail, truck, or barge units.

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[7] Federal Energy Administration, Freight Car Requirements for Transporting Energy, 1974-1985, November 1974.

[8] Manalytics, Inc. (for Electric Power Research Institute), Coal Transportation Capability of the Existing Rail and Barge Network, 1985 and Beyond, 1978.

[9] Transporting the Nation's Coal, Op Cit.

Table 6-10

Equipment Needs Forecasts

| ~~Author~~ Source of Estimate | Assumed 1985 Coal Production Level (in 000's) | Required Barges | Required Towboats | Required Loco. | Required Open Hopper Cars |
|---|---|---|---|---|---|
| Bureau of Mines | 926,061 | 3,366 | 405 | 6,900 | 251,400 |
| Manalytics Inc. | 1,241,800 | 1/ | 1/ | 10,645 | 212,914 |
| R.L. Banks & Associates Estimate (Dept. of Energy Mid-Level Production Level | 1,115,500 | 3,445 | 182 | 10,134 | 202,671 |
| Association of American Railroads | 1,100,000 | 1/ | 1/ | 6,700 2/ | 134,000 2/ |

Sources: Bureau of Mines, Information Circular 8706, Coal Transportation Practices and Equipment Requirements to 1985, 1976; Manalytics, Inc. (for Electric Power Research Institute), Coal Transportation Capability of the Existing Rail and Barge Network, 1985 and Beyond, 1976; Association of American Railroads, Background on Transportation, Coal and the R.R., 1978.

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1/ Not estimated.

2/ For a 10 year period (low unit train frequency assumed).

6.2.2.2 Uses of Coal as an Energy Source. Coal is used almost exclusively as a source of heat and power. The largest and fastest growing market for coal is the electric utility industry, which accounted for 72 percent of total bituminous coal and lignite consumption in 1975 (Westerstrom and Harris, 1975). At present, coal accounts for more than 52 percent of total power generation, and 59 percent of total generation by fossil fuels. This is a result, primarily, of the relatively low cost of coal (Statistical Abstracts, 1977). How long coal will maintain its dominant position is subject to the interplay of many variables including reserves, availability, prices of competitive energy sources, relative efficiency in utilization, and environmental constraints.

Another major use for coal is in the primary metal industries, principally for the production of coke for use in blast furnances of the steel industry, and for the self-generation of power at steel and rolling mills. These uses accounted for approximately 15 percent of coal consumption in 1975 (Westerstrom and Harris, 1975). The amount of coal used for such purposes in the future will be dependent upon demand for iron and steel and on the result of new technological developments for reducing iron ores, thereby reducing coke requirements.

In many markets, the use of coal has declined drastically in the last three decades. Use of coal for household and commercial use has dropped from 120 million tons in the 1940's to 7.3 million tons in

1975 (Westerstrom and Harris, 1975). In 1944, railroads and sea and lake vessels were the largest consumers of coal, using about 132 million tons per year. By 1975, use of coal for transportation purposes was negligible. Since 1950, the use of coal in the food, paper, chemical, and allied industries has dropped steadily, as has use in the stone, clay, and glass products group.

This trend is now reversing, however. Major uses of coal in the future are expected to be similar to present uses, but major increases in consumption are projected, primarily for generating electric power. In addition to present uses, coal will be used to manufacture synthetic gas and liquid fuels. Coal use for these products (all uses other than electric production) should equal that used for electric power generation by the year 2000 (U.S. Energy Research and Development Administration, 1977). It has been projected that coal requirements for liquefaction and gasification in the year 2000 will be as high as 826 million tons (U.S. Energy Research and Development Administration, 1977). Appendix ___, Table ___, indicates present (1976) and future projections (1985,1990) of coal uses for the seven coal leasing strategies evaluated.

In 1977, electric utilities projected their future load growth (DOE-FERC, 1978). The national ten-year average annual growth in electric energy demand projected by the industry is 5.8 percent per year, and the projected electric generation from coal plants will increase from 46.3 percent in 1976 to 47.7 percent by 1981 and 1986.

At the beginning of 1977, electric utilities were planning to

bring into service 260 new coal fired units over the ten year period 1977-1986 (135,146 MWe). By the end of 1986, the coal demand of these new units will be 445 million tons a year. Traditionally, a new mine would be established to serve the needs of a particular generating station. Such mining additions require several years to construct; consequently, the timely execution of a long-term coal supply contract by the utilities is a key requirement.

About 52.6 percent of the new coal-fired capacity additions are in the West, and coal mines located west of the Mississippi River will serve most of these new units. As of October 1977, the utilities had 63 percent (261.5 million tons) of the incremental coal demand for the new units under contract (DOE,FERC, 1978). Most of this coal will be produced in the western states. Also the additional 37 percent (193.4 million tons) may have to come from western Federal coal.

The updated information on new coal-fired units scheduled for operation from 1977 to 1986, and their projected coal requirements obtained from the FERC's regional offices, is summarized by state and geographic region in Table 6-11 The estimated annual cummulative and incremental coal demand of the new units coming on line from 1977 through 1986 is shown in Table 6-12, Figure 6-9 and Figure 6-10

EPA Regulations. Existing State and Federal Air Regulations may constrain coal development. The air regulations most applicable are:

- National Ambient Air Quality Standards (NAAOS's) for designated

# TABLE 6-11

## COAL REQUIREMENTS FOR NEW COAL UNITS SCHEDULED FOR OPERATION BETWEEN 1977-1986

| STATE AND GEOGRAPHIC REGION | TOTAL NEW COAL UNITS SCHEDULED FOR OPERATION BETWEEN 1977-1986 NO. OF UNITS | CAPACITY (MW) | TOTAL INCREMENTAL COAL DEMAND IN 1986 (1000 TONS) | QUANTITY ASSURED BY CONTRACT (1000 TONS) | % OF DEMAND |
|---|---|---|---|---|---|
| CONN | 0 | - | - | - | - |
| ME | 0 | - | - | - | - |
| MASS | 0 | - | - | - | - |
| N H | 0 | - | - | - | - |
| R I | 0 | - | - | - | - |
| VT | 0 | - | - | - | - |
| NEW ENGLAND REGIONAL TOTAL | 0 | - | - | - | - |
| N Y | 3 | 2400 | 6827 | 0 | 0.0 |
| P A | 8 | 5774 | 14300 | 4300 | 30.1 |
| N J | 0 | - | - | - | - |
| MID ATLANTIC REGIONAL TOTAL | 11 | 8174 | 21127 | 4300 | 20.4 |
| ILL | 5 | 3985 | 8012 | 2675 | 33.4 |
| IND | 12 | 7620 | 22356 | 15584 | 69.6 |
| MICH | 10 | 3379 | 8584 | 4999 | 58.2 |
| OHIO | 7 | 3609 | 6750 | 4250 | 63.0 |
| WISC | 5 | 3837 | 12100 | 6150 | 51.2 |
| EAST NORTH CENTRAL REGIONAL TOTAL | 47 | 22430 | 57842 | 33698 | 58.3 |
| IA | 8 | 3151 | 9746 | 5340 | 54.8 |
| KAN | 8 | 4105 | 12505 | 10250 | 82.0 |
| MINN | 6 | 4600 | 16000 | 4400 | 27.5 |
| MO | 6 | 2955 | 8000 | 5250 | 65.6 |
| NEB | 4 | 1875 | 6673 | 6323 | 94.8 |
| N D | 7 | 2588 | 18100 | 18100 | 100.0 |
| S D | 0 | - | - | - | - |
| WEST NORTH CENTRAL REGIONAL TOTAL | 39 | 19674 | 71024 | 49663 | 69.9 |
| DELA | 1 | 400 | 800 | 0 | 0.0 |
| FLOR | 8 | 3826 | 7364 | 0 | 0.0 |
| GA | 8 | 5915 | 12771 | 8751 | 68.5 |
| MD | 1 | 800 | 1500 | 0 | 0.0 |
| N C | 3 | 2160 | 4314 | 4314 | 100.0 |
| S C | 5 | 1690 | 2654 | 0 | 0.0 |
| W VA | 3 | 2552 | 6500 | 0 | 0.0 |
| D C | 0 | - | - | - | - |
| V A | 0 | - | - | - | - |
| SOUTH ATLANTIC REGIONAL TOTAL | 29 | 17343 | 35943 | 13065 | 36.3 |
| ALA | 10 | 6272 | 9800 | 600 | 6.1 |
| KY | 15 | 7208 | 16658 | 6638 | 39.8 |
| MISS | 6 | 2569 | 6268 | 2736 | 43.7 |
| TENN | 0 | - | - | - | - |
| EAST SOUTH CENTRAL REGIONAL TOTAL | 31 | 16049 | 32726 | 9974 | 30.5 |
| ARK | 6 | 3828 | 14710 | 12960 | 88.1 |
| LA | 8 | 4205 | 15611 | 9817 | 62.9 |
| OKLA | 13 | 6210 | 19901 | 9001 | 45.2 |
| TEX | 32 | 18677 | 81568 | 72745 | 89.2 |
| WEST SOUTH CENTRAL REGIONAL TOTAL | 59 | 32920 | 131790 | 104523 | 79.3 |
| ARIZ | 9 | 2705 | 7535 | 5615 | 74.5 |
| COLO | 10 | 3754 | 12687 | 5927 | 46.7 |
| MONT | 2 | 1400 | 5665 | 5665 | 100.0 |
| NEV | 4 | 1500 | 7170 | 5770 | 80.5 |
| N M | 3 | 1432 | 6234 | 4034 | 64.7 |
| UTAH | 8 | 3335 | 9116 | 5316 | 58.3 |
| WYO | 5 | 2330 | 10628 | 10628 | 100.0 |
| MOUNTAIN REGIONAL TOTAL | 41 | 16456 | 59035 | 42955 | 72.8 |
| CALF | 2 | 1600 | 4200 | 2100 | 50.0 |
| ORE | 1 | 500 | 1200 | 1200 | 100.0 |
| WASH | 0 | - | - | - | - |
| PACIFIC REGIONAL TOTAL | 3 | 2100 | 5400 | 3300 | 61.1 |
| U.S. TOTAL | 260 | 135146 | 414687 | 261478 | 63.0 |

TABLE 6-12

ESTIMATED ANNUAL CUMULATIVE COAL DEMAND OF NEW UNITS, 1977-1986

| Year | Cumulative Demand (1000 Tons) | Quantity Under Contract (1000 Tons) | Percent Under Contract (%) |
|---|---|---|---|
| 1977 | 20,544 | 20,544 | 100.0 |
| 1978 | 62,095 | 61,045 | 98.3 |
| 1979 | 98,087 | 91,844 | 93.6 |
| 1980 | 147,224 | 132,550 | 90.0 |
| 1981 | 195,202 | 164,863 | 84.5 |
| 1982 | 228,927 | 188,550 | 82.4 |
| 1983 | 260,457 | 205,473 | 78.9 |
| 1984 | 294,797 | 221,850 | 75.3 |
| 1985 | 344,963 | 242,837 | 70.4 |
| 1986 | 405,111 | 258,907 | 63.9 |
| Annual Demand Rate at End of 1986 | 414,887 | 261,478 | 63.0 |

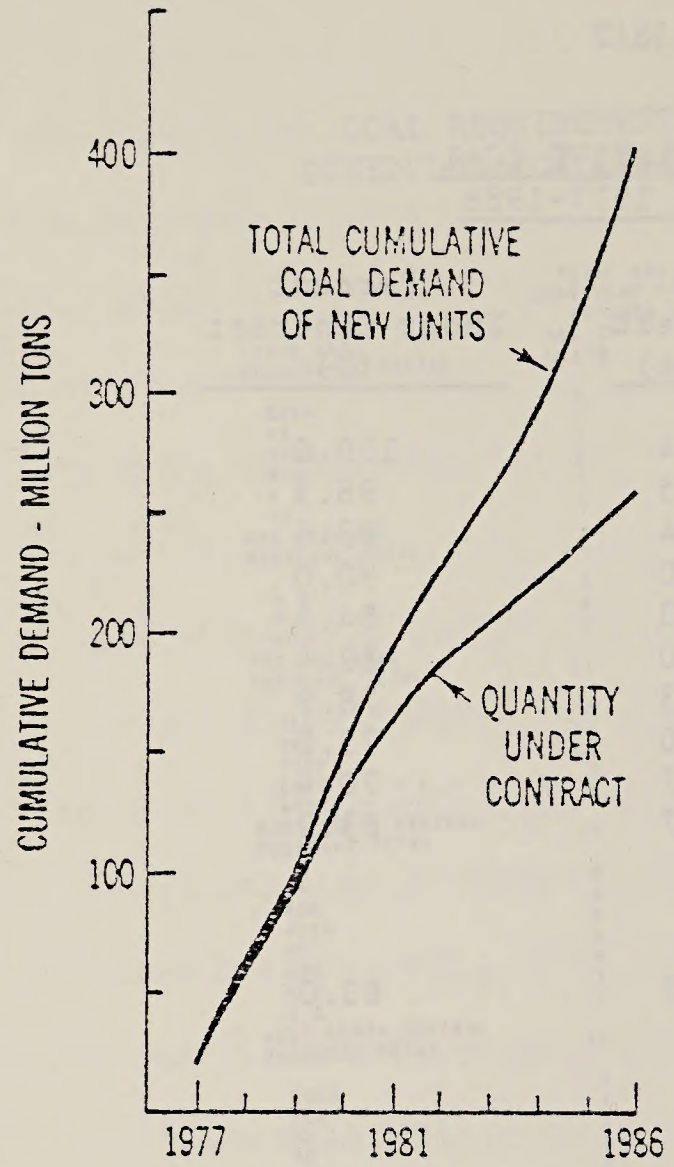



Figure 6-9

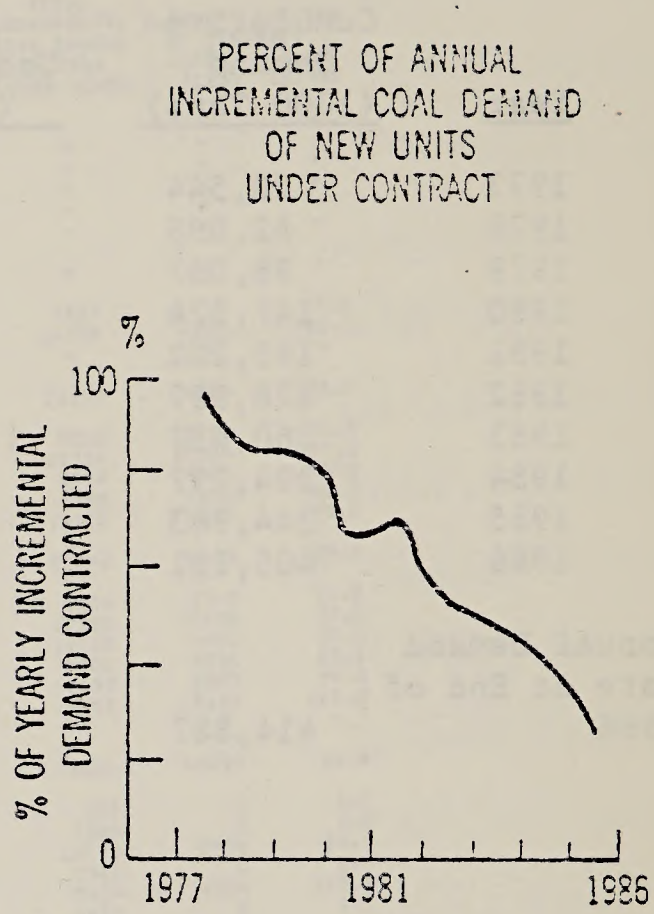



Figure 6-10

air pollutants having an adverse effect on public health and welfare (i.e., primary and secondary standards)

- State plans for implementation and enforcement of primary and secondary standards (SIP's)

- Standards of performance for new stationary sources reflecting best available control technology

- National emission standards for air pollutants considered hazardous to human health (and not covered by an ambient air quality standard) (Section 112)

- Emission Standards for Moving Sources, which are required by the Clean Air Act to reduce mobile source emissions at least below a given level (Sections 202, 211 an 231)

- Improved and expanded enforcement provisions allowing direct Federal action in all cases of alleged violation of national air quality standards, new source performance standards, hazardous pollutant standards, and all other elements of state implementation plans

- Provisions for citizen suits based either on alleged violation of standards or failure of the U.S. Environmental Protection Agency to initiate requisite enforcement actions.

On August 7, 1977 the Congress passed the Clean Air Act Amendments of 1977 (P.L. 95-95) which have several features that apply directly to the Coal Leasing Program. The two most significant provisions are the new requirements governing areas which failed to obtain the National Ambient Standards by the statutory deadline (nonattainment areas), and the modified provisions for preventing significant deterioration of air quality in areas where the air is cleaner than the National Ambient Standards (PDS). These provisions require that air quality be maintained or improved.

In addition, the 1977 Act authorizes the Federal Government to develop new source performance standards (NSPS) which limit emissions of particular substances from specific processes or unit operations that are newly constructed or "substantially modified" subsequent to publication of the NSPS (Table 6-13). The standards are to be achieved through the application of the best available control technology adequately demonstrated in plant operation. NSPS standards have not yet been promulgated for most types of coal conversion plants, but NSPS must be promulgated before 1981 for all categories of major stationary sources which were not listed before August 7, 1977.

On September 11, EPA proposed new source performance standards for coal-fired power plants. These standards would require reduction of sulfur emissions by 85% or a maximum $SO_2$ emission rate of 1.2 lb./million Btu. Thus, most coals would require cleaning through flue gas desulfurization, gasification, etc. Particulate emissions are proposed to be 0.03 lb./million Btu, while $NO_x$ emissions will be limited to 0.5 lb./million Btu for subbituminous coal and 0.6 lb. for bituminous coal. (U.S. Environmental Protection Agency, 1978.)

State and local authorities may promulgate air quality standards that are more stringent than the national standards, or that apply to pollutants or averaging times not covered by Federal regulations.

Table 6-14, summarize air quality standards for states in the coal regions considered in this statement.

Table 6-13

SELECTED NEW SOURCE PERFORMANCE STANDARDS
(NSPS) FOR AIR POLLUTION SOURCES

| Source | Pollutant | Emission not to exceed |
|---|---|---|
| Steam Generators ($\geq 250 \times 10^6$ Btu/hr input) | Particulate Matter | 0.10 lb/$10^6$ Btu input 20% opacity (except for one 6-minute period per hour of not more than 26% opacity). |
| | Sulfur Dioxide | 0.80 lb/$10^6$ Btu input (liquid fossil fuel and wood residue). |
| | | 1.2 lb/$10^6$ Btu input (solid fossil fuel or solid fossil fuel and wood residue). |
| | | When different fossil fuels are burned simultaneously in any combination, the applicable standard (in ng/J) shall be determined by proration using the following formula: $PXSo_2 = \frac{y(340) + z(520)}{y + z}$ where: $PSSo_2$ is the prorated standard for sulfur dioxide when burning different fuels simultaneously, in nanograms/joule heat input derived from all fossil fuels or from all fossil fuels and wood residue fired, y is the percentage of total heat input derived from liquid fossil fuel and z is the percentage of total heat input derived from solid fossil fuel. |
| | Nitrogen oxides (expressed as $NO_2$) | 0.20 lb/$10^6$ Btu derived from gaseous fossil fuel or gaseous fossil fuel and wood residue. |

Source: Bureau of National Affairs, Inc. 1978

Table 6-13 (continued)

| Source | Pollutant | Emission not to exceed |
|---|---|---|
| | | 0.30 lb/$10^6$ Btu derived from liquid fossil fuel or liquid fossil fuel and wood residue.<br><br>0.70 lb/$10^6$ Btu derived from solid fossil fuel or solid fossil fuel and wood residue (except lignite or a solid fossil fuel containing 25%, by weight, or more of coal refuse).<br><br>When different fossil fuels are burned simultaneously in any combination, the applicable standards (in ng/J) shall be determined by using the following formula:<br>$PSNO_x = \frac{x(86) + y(130) + z(300)}{x + y + z}$<br><br>where:<br>$PSNO_x$ is the prorated standard for nitrogen oxides when burning different fuels simultaneously, in nanograms per joule heat input derived from all fossil fuels fired or from all fossil fuels and wood residue fired,<br>x is the percentage of total heat input derived form gaseous fossil fuel,<br>y is the percentage of total heat input derived from liquid fossil fuel,<br>z is the percentage of total heat input derived from solid fossil fuel (except lignite or a solid fossil fuel containing 25 percent, by weight, or more of coal refuse). |
| Petroleum Refineries | Particulate Matter | 1.0 kg/1000kg (1.0 lb/1000 lb) of coke burn-off in the catalyst regenerator. |
| Catalytic Checking Unit<br>Catalyst Regenerator | | Gases exhibiting >30% opacity, except for one six-minute average opacity reading in any one hour period. |
| Incinerator-waste heat boiler | | 1.0 lb/1000 lb + 0.1 lb/million Bt |

Table 6-13 (Concluded)

| Source | Pollutant | Emission not to exceed |
|---|---|---|
| | Carbon Monoxide | 0.050% CO by volume. |
| | Sulfur Dioxide | 230 mg/dscm of $H_2S$ in fuel gas (0.10 gr/dscf) |
| Storage Vessels for Petroleum Liquids (Storage vessels 40,000 gal) | Hydrocarbons | If the true vapor pressure of the petroleum liquid as stored is ≥75 mm Hg (1.5 psia), but <570 mm Hg (11.1 psia), storage vessel shall be equipped with a floating roof, vapor recovery system or their equivalents. |
| | | If true vapor pressure of the petroleum liquid as stored is >570 mm Hg (11.1 psia), storage vessel shall be equipped with a vapor recovery system or its equivalent. |
| Iron and Steel Plants | Particulate Matter | Any gas containing 50 mg/dscm (0.022 gr/dscf) |
| Coal Preparation Plants | Particulate Matter | Thermal dryer gases: 0.070 g/dscm (0.031 gr/dscf) |
| | | 20% opacity or greater |
| | | Pneumatic coal cleaning equipment gases: 0.040 g/dscm (0.018 gr/dscf) |
| | | 10% opacity or greater |
| | | From any coal processing and conveying equipment, coal storage system, or coal transfer and loading system processing coal gases with: 20% opacity or greater. |

Source: Bureau of National Affairs, Inc. 1978b.

TABLE C-14

## PRIMARY AMBIENT AIR QUALITY STANDARDS
## ALL CONCENTRATIONS IN $\mu g/m^3$

| State | Sulfur Dioxide | | | Suspended Particulate Matter | | Nitrogen Oxides | Carbon Monoxide | | Hydrocarbons |
|---|---|---|---|---|---|---|---|---|---|
| | Annual Arithmetic Mean | 24-Hour Maximum | 1-Hour Maximum | Annual Geometric Mean | 24-Hour Maximum | Annual Arithmetic Mean | 8-Hour Maximum | 1-Hour Maximum | 3-Hour Maximum |
| Alabama | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Alaska | 80 | 365 | - | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| Arizona | 80 | 365 | - | 75 | 150 | 100 | 10,000 | 40,000 | 160 |
| Arkansas | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| California | 80 | 133[a,e] | 1333 | 60 | 100 | 470[h] | 11,000[i] | 46,000[j] | 160 |
| Colorado | 15[a] | 100[a] | - | 45[g] | 150 | 100 | 10,000 | 40,000 | 160 |
| Connecticut | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Delaware | 80 | 340 | - | 70 | 200 | 100 | 9,200 | 40,000 | 131 |
| District of Columbia | 75 | 285 | 860 | 75 | 160 | 100 | 10,000 | 40,000 | 160 |
| Florida | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| Georgia | 43 | 229 | 715 | 60 | 150 | 100 | 10,000 | 40,000 | 98 |
| Hawaii | 20 | 80 | - | 55 | 100 | 70 | 5,000 | 10,000 | 100 |
| Idaho | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Illinois | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Indiana | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Iowa | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Kansas | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Kentucky | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| Louisiana | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Maine | 57 | 239 | - | 50 | 100 | 100 | 10,000 | 40,000 | 160 |
| Maryland[c] | 79 | 262 | - | 75[g] | 160 | 100 | 10,000 | 40,000 | 160 |

TABLE 6-14
(continued)

| State | Sulfur Dioxide | | | Suspended Particulate Matter | | Nitrogen Oxides | Carbon Monoxide | | Hydrocarbons |
|---|---|---|---|---|---|---|---|---|---|
| | Annual Arithmetic Mean | 24-Hour Maximum | 1-Hour Maximum | Annual Geometric Mean | 24-Hour Maximum | Annual Arithmetic Mean | 8-Hour Maximum | 1-Hour Maximum | 3-Hour Maximum |
| Massachusetts | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Michigan | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Minnesota | 60 | 260 | - | 75 | 260 | 100 | 10,000 | 30,000 | 160 |
| Mississippi | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Missouri | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Montana | 53 | 267 | - | 75 | 200[d] | 100 | 10,000 | 40,000 | 160 |
| Nebraska | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Nevada | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| New Hampshire | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| New Jersey | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| New Mexico | 53 | 267 | - | 60 | 150 | 100 | 9,667** | 14,556 | 127** |
| New York | 80 | 365 | - | 75 | 250 | 100 | 10,000 | 40,000 | 160 |
| North Carolina | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| North Dakota | 60 | 260 | 715 | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| Ohio | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 40,000 | 126 |
| Oklahoma | 80 | 130[f] | 1,200[f] | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Oregon | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| Pennsylvania | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Rhode Island | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |

TABLE 6-14
(continued)

| State | Sulfur Dioxide | | | Suspended Particulate Matter | | Nitrogen Oxides | Carbon Monoxide | | Hydrocarbons |
|---|---|---|---|---|---|---|---|---|---|
| | Annual Arithmetic Mean | 24-Hour Maximum | 1-Hour Maximum | Annual Geometric Mean | 24-Hour Maximum | Annual Arithmetic Mean | 8-Hour Maximum | 1-Hour Maximum | 3-Hour Maximum |
| South Carolina | 80 | 365 | | 60 | 250 | 100 | 10,000 | 25,000 | 130 |
| South Dakota | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 15,000 | 125 |
| Tennessee | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Texas | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Utah | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160** |
| Vermont | 57 | 150 | 285 | 45 | 125 | 100 | 10,000 | 35,000 | 160 |
| Virginia | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Washington | 53 | 267 | 1060 | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| West Virginia | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Wisconsin | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |
| Wyoming | 60 | 260 | - | 60 | 150 | 100 | 10,000 | 40,000 | 160 |
| FEDERAL | 80 | 365 | - | 75 | 260 | 100 | 10,000 | 40,000 | 160 |

[a]Category III (Urban), amount allowed above existing baseline ambient.
Category II (Rural) - 10 Annual, 50 24-hour
Category I (Pristine) - 2 Annual, 5 24-hour
[c]Upper limit of the more adverse range.
[d]Not to be exceeded more than 1% of days a year.
[e]Level IV densely populated, large metropolitan areas or areas of heavy industry.
[f]Average of time period.
[g]Annual Arithmetic Average.
[h]1 hour maximum.
[i]12 hour maximum.
[j]In apparent violation with the Federal standard.

*Federal standards are given in the absence of state standards.
**ppm were converted to $kg/m^3$.

Source: Bureau of National Affairs, Inc., 1978.

To date the EPA has promulgated National Ambient Air Quality Standards for six pollutants, often referred to as criteria pollutants. Five of these pollutants are listed in Table 6-15. The annual average standards for particulates, $SO_2$, and $NO_2$ were designed to protect against long-term effects of relatively low concentration levels. The 24-hour and shorter-period standards were designed to protect against acute effects resulting from exposure to high concentrations for short periods of time. As of 1978, EPA has established National Ambient Air Quality Standards (NAAQS) for six pollutants (see Table 6.2-5). Attainment and maintenance of the standards is the primary responsibility of the states. Under the 1977 Amendments, after June 30, 1979, construction or modification of major new sources which would aggravate existing NAAQ's violations must be prohibited unless the SIP meets the requirements of the new Act governing nonattainment areas. Thus, states whose SIP revisions have not been approved by July 1, 1979, may not allow any major new sources to construct or modify in nonattainment areas. In addition, the plans must be revised to incorporate the Amendment's new requirements on preventing significant deterioration. While the objective of the SIP and nonattainment provisions is to achieve and maintain the ambient standards, the purpose of the PSD is to prevent significant deterioration of air which is already cleaner than the ambient standards.

TABLE 6-15

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)
40 CFR 50

NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARDS
(Expressed as micrograms per cubic meter [$\mu g/m^3$] at 25°C, 760 mm pressure)

| POLLUTANT | PRIMARY STANDARD | | SECONDARY STANDARD | |
|---|---|---|---|---|
| | Annual Mean | Maximum Concentration (Allowed Once Yearly) | Annual Mean | Maximum Concentration (Allowed Once Yearly) |
| Sulfur Oxides ($SO_X$) (measured as $SO_2$) | 80 | 365 (over 24 hours) | | 1300 (over 3 hours) |
| Particulates | 75 | 260 (over 24 hours) | 60 | 150 (over 24 hours) |
| Carbon Monoxide (CO) | -- | 10 milligrams/$m^3$ (over 8 hours) 40 milligrams/$m^3$ (over 1 hour) | Same as Primary Standard | |
| Photochemical Oxidants | -- | 160 (over 1 hour) | Same as Primary Standard | |
| Hydrocarbons (HC) | -- | 160 (over 3 hours-- 6-9 a.m.) | Same as Primary Standard | |
| Nitrogen Dioxide ($NO_2$)* | 100 | -- | Same as Primary Standard | |

*The Clean Air Act Amendments of 1977 directed EPA to investigate the necessity for establishing a short-term (i.e., 1-3 hours) standard for $NO_2$.

NOTE: EPA has proposed a primary ambient standard for lead of 1.5 $\mu g/m^3$

NOTE: EPA is considering the establishment of a respirable particulate standard in connection with the planned revisions to its $SO_2$ and TSP criteria documents. Sulfates are among the most significant respirable particulates.

One issue that could have significant impacts on the future utilization of coal-fired generators is the Significant Deterioration Amendments to the Clean Air Act. The new amendments made three immediate changes to EPA's PSD regulations:

- o New mandatory class I areas;
- o Revised increments;
- o New reclassification procedures.

Initially, PSD "increments" will apply to $SO_2$ and particulate matter, but by August 1979, EPA must promulgate PSD regulations for hydrocarbons, photochemical oxidants, nitrogen oxides, and carbon monoxide. Table 6-16 specifies allowable deterioration increments.

The potential imapct of the PSD regulations on coal-fired power plants is great. Any moderate-to-large-size facility can conceivably create pollutant concentration increments in excess of the PSD requirements without even considering the effects of other nearby sources. These would be strong forces influencing the size and siting of new power plants. Many of the studies conducted on the impact of PSD regulations reach opposing conclusions but there are a few areas of agreement: (1) Class I areas present a major obstacle to growth, (2) industry capital costs will increase as a result of prevention of significant deterioration regulations, (3) facility size, emission control technology, and siting will be influenced by the regulations, and (4) future growth will be restricted by the elimination of Class III areas.

TABLE 6-16

PREVENTION OF SIGNIFICANT DETERIORATION INCREMENT

| APPLICABILITY | MAXIMUM ALLOWABLE INCREASE $\mu g/m^3$ | |
|---|---|---|
| | SULFUR DIOXIDE | PARTICULATE MATTER |
| Class I Areas | 2 (annual arith mean) | 5 (annual geom mean) |
| (Restricted Development) | 5 (24-hr max.) | 10 (24-hr max.) |
| | 25 (3-hr max.) | |
| Class II Areas | 20 (annual arith mean) | 19 (annual geom mean) |
| (Modest Development) | 91 (24-hr max.) | 37 (24-hr max.) |
| | 512 (3-hr max.) | |
| Class III Areas | 100 (3-hr max.) | 37 (annual geom mean) |
| (Concentrated Development) | 40 (24-hr max.) | 75 (24-hr max.) |
| | 182 (annual arith mean) | |

Note: For specified nonannual periods (e.g., 24-hr, 3-hr) the allowable increment may be exceeded during only one such period per year at any receptor site.

Source: 42 U.S.C. 7401, November 16, 1977.

Water Quality Regulations. The Environmental Protection Agency has developed effluent limitation guidelines and new source performance standards for wastewater discharges from steam electric power generating plants as outlined in Table 5.2-8 which is taken from an Environmental Protection Agency development document. These regulations fall into two categories: (1) best practicable control technology currently available (BPCTCA), and (2) best available technology economically achievable (BATEA). These standards must be met no later than July 1, 1983. It should be noted that with technologies designated as BPCTCA or BATEA, terms such as "best practicable" or "best available" do not limit the choice to a single process. Any technology that meets the stated effluent limitations may be used.

Table 6-17 summarizes the major water pollutants from coal-fired power plants and their sources. Current applicable treatment technologies are summarized in Table 6-18.

Other regulations that affect the discharge of wastewater from power plants include receiving-water quality standards, pretreatment standards, limitations for toxic substances, drinking-water standards, and specific state and local standards.

Table 6-17 Summary of Effluent Limitations Guidelines and Standards for Pollutants Other Than Heat from Steam Electric Power Generating Plants[13]

| Source | Pollutant Parameter | Effluent Limitations[a] | | |
|---|---|---|---|---|
| | | BPCTCA (1977) | BATEA (1983) | New Sources |
| Nonrecirculating cooling water | Free Available Chlorine | | 0.2 (0.5 max)[b] | |
| | Total residual chlorine | | [b] | |
| Cooling tower blowdown | Free available chlorine | | 0.2 (0.5 max)[b] | - |
| | Total residual chlorine | | [b] | |
| | Chromium, total | No limitation | 0.2 (0.2 max) | - |
| | Zinc, total | " | 1.0 (1.0 max) | - |
| | Total phosphorus (as P) | " | 5.0 (5.0 max) | - |
| | Corrosion inhibiting materials other than Cr, Zn, and P | " | Case-by-case | - |
| | All corrosion inhibiting materials | " | - | No discharge |
| Ash transport | Total suspended solids | 30 (100 max) | - | - |
| | Oil and grease | 15 ( 20 max) | - | - |
| Bottom ash transport | Total suspended solids | - | 2.4 (8.0 max) | 1.5 (5.0 max) |
| | Oil and grease | - | 1.2 (1.6 max) | 0.75 (1.0 max) |
| Fly ash transport | Total suspended solids | - | 30 (100 max) | No discharge |
| | Oil and grease | - | 15 ( 20 max) | No discharge |
| Low-volume wastes | | | | |
| Boiler Blowdown | Total suspended solids | | 30 (100 max) | |
| | Oil and grease | | 15 ( 20 max) | |
| | Copper, total | | 1.0 (1.0 max) | |
| | Iron, total | | 1.0 (1.0 max) | |
| Metal equipment cleaning wastes | Total suspended solids | | 30 (100 max) | |
| | Oil and grease | | 15 ( 20 max) | |
| | Copper, total | | 1.0 (1.0 max) | |
| | Iron, total | | 1.0 (1.0 max) | |
| Others, except sanitary wastes and radwastes | Total suspended solids | | 30 (100 max) | |
| | Oil and grease | | 15 ( 20 max) | |
| Rainfall runoff from materials storage piles and construction activities | Total suspended solids | | Not to exceed 50 mg/l | |
| Rainfall runoff from other sources[c] | All pollutant parameters | | No limitation | |
| Sanitary wastes and radwastes | All pollutant parameters | | No limitation | |
| All sources | Polychlorinated biphenyls | | No discharge | |
| | pH value[d] | | Within the range 6.0-9.0 at all times | |

[a]Note: Numbers are concentrations, mg/l, except for pH values. Effluent limitations, except for pH and rainfall runoff, are quantities of pollutants to be determined by multiplying the concentration indicated times the flow of water from the corresponding source. Effluent limitations are averages of daily values for 30 consecutive days (maximum values for any one day are determined from the numbers in parentheses), except for pH and rainfall runoff. In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant attributable to each waste water source shall not exceed the limitation for that source. No limitations are prescribed for sources/pollutants not specified in this table.

[b]Note: Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours (aggregate) in any one day and not more than one unit in any plant may discharge free available chlorine or total residual chlorine at any one time. Exceptions to be made, on a case-by-case basis, if discharger demonstrates that limitations must be exceeded in order for the cooling system to operate efficiently.

[c]Note: ...and from facilities designed, constructed, and operated to treat the volume of material storage runoff and runoff from construction activities that is associated with a 10-yr, 24-hr rainfall event.

[d]Note: From all sources except nonrecirculating cooling water, rainfall runoff from sources other than materials storage piles and construction activities[c], sanitary wastes and radwastes.

# Table 6-18, Chemical Wastes Control and Treatment Technology[13]

| Pollutant Parameter | Control and/or Treatment Technology | Effluent Reduction Achievable | Industry Usage | Costs: Capital | Costs: Operating |
|---|---|---|---|---|---|
| Common: pH | Neutralization with chemicals | Neutral pH | Common | $10-20,000 (tanks, feeder, etc.) | $3-30,000 (chemicals, labor, etc.) |
| Dissolved Solids | 1. Concentration and evaporation | Complete removal | Not generally in use - desalinization technology | $250,000-$1,660,000 costs are significantly less in areas where evaporation ponds are feasible. | $150,000-$450,000 costs are significantly less in areas where evaporation ponds are feasible. |
| | 2. Reverse osmosis | 50-95% | Not in use - desalinization technology | 50-80 c/1000 gal. total cost. | |
| | 3. Distillation | 60-90% | Not in use - desalinization technology | 80-150 c/1000 gal. total cost. | |
| Suspended Solids | 1. Sedimentation | 90-95% | Extensive | $1000 $20,000 / M² based on 500 gpd/M² | 1-20c/1000 gallons |
| | 2. Chemical coagulation and precipitation | 95-99% | Moderate | $10,000-$35,000 / M² based on 500 gpd/M² | 1-20c/1000 gallons |
| | 3. Filtration | 95% | Not generally practiced-water treatment technology. | $7,000-$20,000 / M² based on 500 gpd/M² | 1-20c/1000 gallons |
| Specific: Phosphate (Blowdown, Chemical Cleaning, Floor & Yard Drains, Plant Laboratory & Sampling) | 1. Chemical coagulation and precipitation | | Not generally practiced-water treatment technology. | $10,000-$15,000 / M² based on 500 gpd/M² | 1-20c/1000 gallons |
| | 2. Deep well disposal | Ultimate disposal | not practiced | Costs extremely variable-dependent primarily on geologic conditions. | |
| Iron (Water Treatment, Chemical Cleaning Coal Ash Handling Coal Pile Drainage) | 1. Oxidation, chemical coagulation & precipitation | Removal to 0.1 mg/ℓ | Limited usage | $150-4,000x10³ | 10-100c/1000 gallons |
| | 2. Deep well disposal | ---------- | As described above | ---------- | ---------- |
| Copper (Once-through Condenser Cooling) | 1. Replace condenser tubes with stainless steel or titanium. | Elimination of discharge. | Done in several plants where tubes have eroded or corroded-not done for environmental reasons. | Prohibitively expensive-would not be done except where retubing is required for process reasons. | No incremental operating cost |
| Copper (Blowdown, Chemical Cleaning) | 1. Chemical coagulation and precipitation | Removal to 0.1 mg/ℓ | Limited usage | $100-$9,000/1000 gpd capacity | 10-350c/1000 gallons |
| | 2. Ion exchange | Removal to 0.1 mg/ℓ | Not practiced | $400-$1200/1000 gpd capacity | 31-81c/1000 gallons |
| | 3. Deep well disposal | ---------- | As described above | ---------- | ---------- |
| Mercury (Coal Ash Handling & Coal Pile Drainage) | 1. Reduction & precipitation | Removal to 0.3 mg/ℓ | Limited usage | $700/1000 gpd | 7-27c/1000 gallons |
| | 2. Ion exchange | Removal to 0.1 mg/ℓ | Not practiced | $18,000-$22,000/ 1000 gpd | $1/1000 gallons |
| | 3. Adsorption | Removal to 50 ug/ℓ | Not practiced | $5000-$30,000/ 1000 gpd | $0.50-$2/lb. Mercury removed |

Table 6-18 (Cont'd)

| Pollutant Parameter | Control and/or Treatment Technology | Effluent Reduction Achievable | Industry Usage | Costs Capital | Costs Operating |
|---|---|---|---|---|---|
| Vanadium (Chemical Cleaning) | 1. $H_2S$ treatment precipitation | Removal of low concentrations difficult to achieve | Not practiced | Cost data not available | |
| | 2. Ion exchange | | Not practiced | Cost data not available | |
| Vanadium (Oil Ash Handling) | 1. Convert to dry collection | Ultimate Disposal | Practiced in several plants | Cost data not available | |
| | 2. Total recycle with filtration & precipitation | Complete recycle of liquid | Not generally practiced | Cost data not available | |
| Chlorine (Once-through Condenser Cooling) | 1. Control of residual $Cl_2$ with automatic instrumentation | Control to 0.2 mg/ℓ | Limited usage in the industry-technology from sewage treatment practiced in some plants-all systems are not capable of being converted to mechanical cleaning. | $5,000 | Negligible |
| | 2. Utilize mechanical cleaning | Eliminates $Cl_2$ discharge | | No cost data available | |
| Chlorine (Recirculating) | 1. Control of residual $Cl_2$ with automatic instrumentation | ---------- As described above ---------- | | | |
| | 2. Reduction of $Cl_2$ with sodium bisulfite | Below detectable limits | Being installed in a new nuclear facility; however excess $NaHSO_3$ is discharged | No cost data available | |
| Aluminum/Zinc (Water Treatment, Chemical Cleaning, Coal Ash Handling, Coal Pile Drainage) | 1. Chemical precipitation | Removal to 1.0 mg/ℓ | Limited usage | $500-$3000/1000 gpd | 10-180¢/1000 gallons |
| | 2. Ion exchange | Similar to copper | | | |
| | 3. Deep well disposal | ---------- As described above ---------- | | | |
| Oil (Chemical Cleaning, Ash Handling, Floor & Yard Drains) | 1. Oil-water separator (sedimentation with skimming) | Removal to 15 mg/ℓ | Common usage | $1,500-$15,000 based on 500 gal/MW 25-400 MW range | No data |
| | 2. Air flotation | Removal to 10 mg/ℓ | Limited usage | $5,000-$50,000 | No data |
| Iron (Ash Handling, Coal Pile Drainage, Floor & Yard Drains) | 1. Biological treatment | Removal to 1 mg/ℓ | Not practiced in the industry. | $130-$2800/1000 gpd | 22¢/1000 gallons |
| | 2. Ozone treatment | Removal to 0.01 mg/ℓ | Not practiced in the industry | No data | No data |
| | 2. Activated carbon | Removal to 0.01 mg/ℓ | Not practiced in the industry. | $30-$350/1000 gpd | 4¢-15¢/1000 gallons |
| Sulfate/Sulfite (Water Treatment, Chemical Cleaning, Ash Handling, Coal Pile Drainage, $SO_2$ Removal) | Ion exchange (sulfate) Oxidation & ion exchange (sulfite) | 75-95% | Not practiced in the industry. | Total cost of $2.00/1000 gallons | |
| Ammonia (Water Treatment, Blowdown, Chemical Cleaning, Closed Cooling Water Systems) | 1. Stripping | 50-90% | Not practiced; several installations in sewage treatment | Total cost - 3¢/1000 gallons | |
| | 2. Biological nitrification | Removal to 2 mg/ℓ | Not practiced for these waste streams | No data available | |
| | 1. Ion exchange | 80-95% | Not practiced | Total cost - 10¢/1000 gallons | |

Table 6-18 (Cont'd)

| Pollutant Parameter | Control and/or Treatment Technology | Effluent Reduction Achievable | Industry Usage | Costs | |
|---|---|---|---|---|---|
| | | | | Capital | Operating |
| Oxidizing Agents (Chemical Cleaning) | Neutralization with reducing agent and precipitation where necessary. | Neutral pH & 95% removal | Limited usage | No data available | |
| BOD/COD (Sanitary Wastes) | Biological treatment | 85-95% | Common practice | $25,000-$35,000 | Negligible |
| COD (Water Treatment, Chemical Cleaning) | 1. Chemical oxidation | 85-95% | Limited usage | No data available | |
| | 2. Aeration | 85-95% | Not practiced | No data available | |
| | 3. Biological | 85-95% | Not practiced | No data available | |
| Fluoride (Chemical Cleaning) | Chemical precipitation | Removal to 1 mg/ℓ | Limited usage | Total cost - 10-50¢/1000 gallons | |
| Boron (Low Level Radwastes) | Ion exchange | Removal to 1 mg/ℓ | Not generally practiced - radioactive material would concentrate on ion exchange resin requiring inclusion in solid radwaste disposal system. | No data available | |

6.2.2.3 Public Body/Minority Leasing.

Sales Reserved for Public Bodies. Section 2 of the Federal Coal Leasing Amendments Act of 1975 states that a reasonable number of leasing tracts shall be reserved and offered for lease in accordance with this section to public bodies, including Federal agencies, rural electric cooperatives, or nonprofit corporations controlled by any of such entities; provided, that the coal so offered for lease shall be for use by such entity or entities in implementing a definite plan to produce energy for their own use or for sale to their members or customers (except for short-term sales to others). No bid shall be accepted which is less than the fair market value, as determined by the Secretary, of the coal subject to the lease.

Regulation 43 CFR 3525.2-1 requires that the Secretary reserve and offer a reasonable number of coal lease tracts within competitive lease sales each year as special leasing opportunities. Only public bodies which have definite plans to produce energy will be eligible to bid for such designated lease tracts. The Secretary may designate public body lease tracts only if a public body has requested that the subject procedures be initiated. Coal leased under these requirements must be leased at its fair market value and may be assigned only to another public body. Qualification requirements for public bodies are located in 43 CFR 3502.9, which outlines the data and material that must be submitted by a public body in order to participate in public body lease sales and to obtain such designated leases.

No requests have been received from a public body for special leasing opportunities (public body leasing). Thus, no tracts have been identified as yet or leased. Prior to FCLAA, there were no provisions for special leasing opportunities for public bodies.

Bidders should be qualified prior to a special leasing opportunity sale and that a lease could be issued as a result of such sale even though only one bidder was qualified to bid. Coal leases issued as a result of special leasing opportunity sales are consistent with FCLAA, provided the lessee has qualified as a public body, there was a competitive offering, and the bid was at least fair market value. With the exception of the presale bidder qualification requirement, sale procedures in public body lease sales are the same as those for regular sales. It appears that the only leasing preference granted to public bodies in the FCLAA is that a reasonable number of tracts be reserved and offered for lease to public bodies. Public bodies can participate in these special, set-aside sales, or in regular coal lease sales.

It has been concluded that the current regulations for public body leasing parallel the policy established in the FCLAA and are adequate. There is no need to amend or modify these regulations.

Minority Leasing Opportunities. As detailed above, FCLAA provides for the awarding of coal leases by competitive bidding only, and the offering of a reasonable number of leasing tracts to public bodies, including Federal agencies, rural electric cooperatives, or nonprofit

corporations controlled by any of such entities provided that the coal is used by such entity or entities in implementing a definite plan to produce energy for their own use or for sale to their members or customers.

In a memorandum dated March 23, 1978, the Assistant Solicitor expressed his opinion that a set-aside program was not contrary to policy in coal amendments because Congress did establish an all-competitive system in the amendments and it also recognized, in the set-aside program for REA's and public bodies, that some social goals were more important than attracting the greatest number of bidders in any single sale. He reasoned that Congress expressly concluded that at least one system of competitive bidding that limits who may bid is consistent with an all-competitive system, but questioned whether the Department has the authority to establish other set-asides to promote equally beneficial public purposes. He referred to the set-aside program for REA's as an exercise by Congress of the power that the Secretary may independently exercise. In a memorandum dated March 27, 1978, the Associate Solicitor, Energy and Resources concurred.

The Small Business Administration, under its section 8(a) program, sets aside certain subcontracts for small businesses. The language in this section has been challenged on the basis that it discriminates on the grounds of race or national origin and, thus, violates the fifth amendment and Federal civil rights law. However, the U.S. District Court for the District of Columbia held that the assertion that the

program is designed to award contracts on the grounds of race has no merit in the face of an eligibility standard that is not defined racially, but by social or economic disadvantage, and that the mere fact that in some areas of the country, "disadvantaged" is synonymous with "minority" is no evidence that anything other than the standard of disadvantaged status was used.

Two options that could address this issue are

- o To create a set-aside program by regulation, under existing law, in which competitive bidding on a certain number of coal leases would be restricted to minority enterprises, or
- o To seek an amendment to the Mineral Lands Leasing Act to provide for the reservation of a reasonable number of tracts to be awarded solely to minority business.

A set-aside program could be created by amending the regulations in 43CFR 3500.0-5 Definitions to include paragraphs defining "Minority Group Members" and a "Minority Business Enterprise." However, promulgation of such regulations might exceed the present statutory authority. It could be argued that the creation of a set-aside program whereby only minority enterprise could bid on a number of coal leases would not contravene the statutory language, because the actual awarding of the lease would still be done on the basis of competitive bidding, and leases could not be issued for less than fair market value. A strong argument can be made based on legislative history, however, that such a program would thwart the underlying goals of 1975

Amendments, because it could significantly narrow the pool of eligible bidders, contrary to Congress' purpose providing wider opportunities for competition.

If coal leasing preferences established by a Mineral Lands Leasing Act amendment were given to minorities rather than socially or economically disadvantaged persons, there could be a constitutional challenge. On March 27, the Associate Solicitor, Energy and Minerals concluded that the authority to establish minority leasing opportunities remains unclear, and it would be better to lay the matter to rest with legislation if legislation could be obtained. If legislation cannot be obtained early, he feels another serious look should be taken at existing authority to determine if there is authority under existing law to institute such a program.

# CHAPTER 7

## MITIGATION OF MAJOR IMPACTS OF COAL PROGRAM

7.1 Introduction
7.2 Program Mitigation
7.3 Mitigation of Socioeconomic Impacts
    7.3.1 Planning
    7.3.2 Funding
    7.3.3 Impact Analysis

This document is a preliminary working draft of the Department of the Interior's Coal Management Environmental Statement. The document is intended for internal review purposes. It will be revised in response to reviewer comments. In addition, internal analysis and revision of materials are continuing.

# CHAPTER 7

# MITIGATION OF MAJOR IMPACTS OF COAL PROGRAM

## 7.1 INTRODUCTION

Mitigation and the related term "mitigating measure" are constructed in their broadest sense as applying to any devices, actions, procedures, or operating priorities that are specifically aimed at reducing either. Existing laws and regulations provide for the establishment and enforcement of appropriate standards of performance applicable to coal mining and to associated development, and for the protection of those areas most susceptible to degradation as a result of coal developments. Compliance with existing regulatory programs is assumed. Therefore, these requirements are not considered mitigating measures.

The programmatic nature of this environmental impact statement does not readily lend itself to a traditional discussion of mitigating measures. Site-specific impacts of the Federal coal management program are not addressed. In this context, the approach underlying this chapter is to first summarize significant elements of the preferred Federal coal management program that establish mechanisms to identify and mitigate adverse impacts of coal development. The chapter then highlights additional mechanisms which address the socioeconomic impacts of coal-related development activities.

## 7.2 PROGRAM MITIGATION

Under the preferred alternative, the Department would rely on land management agency planning systems to provide the initiatives and forums for making the principle decisions in the Federal coal management program. A critical element of the planning process would be the delineation of areas potentially acceptable for mining. A comprehensive review of an area's ecological and socioeconomic resources would help ensure preservation of those resources considered of higher value than coal development. Multiple use, resource trade-off analyses would identify activities that could seriously impair, or perhaps irreversibly preclude, other more desirable activities.

Another mitigating feature of the management program is the Department's mandate to meet the requirements of the National Environmental Policy Act of 1969. National and interregional environmental impacts would be analyzed in programmatic statements such as this document. Regions expected to experience severe environmental and economic consequences would be identified. This information would be used in identifying future production goals and in achieving a better balance between energy needs and the regional development constraints. The regional and site-specific analyses would continue to make available to the Department information on local conditions that may require special mitigating measures or, in certain instances, require postponement of major coal development activities.

A final mitigation measure is the Department's proposal on setting leasing stipulations. Under the preferred program, the technical examination for each proposed lease would be conducted to develop lease terms and conditions. This would provide the information needed to assure that a proposed lease would be economically and environmentally acceptable. Detailed, site-specific conditions would then be imposed in conjunction with mining plan approval.

## 7.3 MITIGATION OF SOCIOECONOMIC IMPACTS

American communities typically treat growth by beginning to plan for it. With coal development expected to expand rapidly, particularly in the western states, the planning horizon for affected communities is limited. Such impacts would be regional and site dependent and involve a very wide range of consequences and requirements. In what follows, broad consideration is given to the Federal role in the mitigation of socioeconomic impacts under the headings (1) planning, (2) funding, and (3) impact analysis.

### 7.3.1 Planning

Local planners are typically accustomed to relatively small scale problems involving, for example, rezonings, set-back requirements, street and traffic system design, and limited development planning. Even 5-year master plan updates seldom involve much more than redrafting of ordinances, planning of new residential areas, expansion of sewage systems, and the like. Many rural communities operate without professional planners or planning boards. The imposition of

a coal conversion plant, for example, onto such a community, or the approval of a major coal lease in an adjacent area would require a major revision of local plans and the accommodation of concepts of a size and nature with which they would be wholly unfamiliar and inexperienced. In this context, such communities would require policy guidance, data, planning assistance, and financial support for planning activities. Table 7-1 lists the range of Federal agencies that would be involved in providing support. Input data as a basis for planning would be provided by appropriate agencies and would include the results of analyses of demonstration plant operations, community growth projections, and life-support facility requirements.

Although several small funding programs are available for the support of comprehensive planning projects -- for example, from the Law Enforcement Assistance Administration, Department of Justice, and the Department of Housing and Urban Development -- considerations would be given to the establishment of a larger Federal funding program oriented specifically toward local and regional planning functions in support of Federal coal development activities.

### 7.3.2 Funding

Although long-term economic advantages would accrue to communities as a result of the siting of coal development projects in their areas, the associated requirements for housing, schools, roads, water supplies, sewage systems, hospitals, transportation, and other life support

Table 7-1. Federal Role in Mitigation of Socioeconomic Problems

| AGENCY / PROBLEM | DOI BOR | DOI CS | DOI F&W | DOI BIA | DOI OBS | DOI BLM | DOL | EDA | EPA | FHA | HEW | HDD | LEAA | HEW NIOSH | DOL OSHA | ERDA | CEQ | TVA | NASA | NIEHS | USDA FS | USDA SCS | USDA ERS | DOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Increase Pop. | | | | | | A | | | | | | A | | | | A | A | B | | | | | B | A |
| New Labor Force | | | | | | A | C | A | | | | A | | | | A | | B | | | | | B | |
| Job Shifts | | | | | | C | C | A | | | | A | | | | B | | | | | 'C | | B | |
| Increase Income | | | | | | A | A | A | | | | A | | | | A | | B | | | | | B | |
| Dual Eco. | | | | A | | A | C | | | | | A | | | | B | | B | | | | | B | |
| Training | | | | C | | | C | | C | | C | | | | | | | | | | | | | |
| Disequilibrium $ | | | | | | | A | | | C | | | | | | | | | | | | | | |
| Aberrant Behavior | | | | A | | | | | | | B | | B | | | B | | | | | | | | |
| Increase Services | | | | A | | | | | | | C | | B | | | B | | | | | | | | |
| Public Ser. | | | | C | | | | A | | C | C | | | | | B | | | | | | | | |
| Schools | | | | C | | | | | | | | | | | | B | | | | | | | B | C |
| Water Sup. | | B | B | | B | C | | C | C | C | | | | | | | A | C | | | C | C | B | |
| Sewage | | | B | | B | | | C | C | C | | | | | | B | A | | | | | | | |
| Housing | | | | C | | | | | | C | | C | | | | B | | | | | | | | |
| Planning | A | | | | B | C | | | | | | C | C | | | B | | | | | | | | |
| Welfare | | | | C | | | C | | | C | C | | | | | B | | | | | A | | B | C |
| Health | | B | | C | | | | | C | C | C | | | B | C | B | B | B | B | B | B | | | |
| Political | | | B | C | | C | | | | | | | | | | | | | | | | | | B |
| Cultural | A | | | C | | A | | | | | A | | | | | B | | | | | | | B | A |
| Recreation | C | | C | A | | C | | | | | | | | | | B | | | | | | | B | A |
| Environ. Quality | A | | A | C | B | C | | | C | | | | | B | | A | C | B | B | B | C | B | B | A |
| Trans. | | | | C | | A | | | B | | | | | | | | | | | | | | | B |
| | | | | | | | | | | | | | | | | | | | | | | | | C |

A=Policy Setting
B=Research
C=Control & Regulation

Sources: U.S. Environmental Protection Agency, Office of Energy and Minerals, 1976. Health, Environmental Effects and Control Technology of Energy Use. Rpt. 600/7-76-002. Willis, B.A., 1976. Socioeconomic Problems Facing Industry. Coal Mining and Processes (June 1976).

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services would impose a burden on present municipalities. In some rural areas local government may be virtually nonexistent and new townships would have to be established. Willis (1976) summarizes Federal assistance available to local communities but most financial aid is directed to water supply, wastewater treatment, housing, and health needs. These funds would supplement revenue derived from Federal coal royalties. .

New funding measures have been addressed in proposed legislation in the current session of Congress. Senate Bill No. 1493, the Energy Impact Assistance Act of 1978, is a major focus.

Under the bill, a state governor or an Indian tribe could designate a community or area as an "energy impact area" if (1) proposed or existing major energy development projects would affect an area's economy or demands for public services, (2) a substantial amount of energy produced in the area would not be locally consumed, and (3) without assistance, there would be an immediate or long-range deficit in public facilities or services, or employment. To be eligible for financial assistance under the bill, states or tribes must prepare mitigation plans that must include information on:

- Projected impacts;
- Needs of designated areas (immediate and long-term);
- Proposals to meet such needs (including priorities);
- Contributions towards needs committed to by energy corporations;
- State and local resources that can be made available to meet such needs;

- Availability of Federal programs to mitigate energy impacts.

Mitigation plans must also assure the establishment of a continuing planning process to repond to energy development impacts during an extended period. Federal grants would be available to defray the cost of preparing these plans.

The Bill also provides public assistance grants and guaranteed loans to states and Indian tribes that prepare adequate mitigation plans. The assistance may be used for:

- Planning research activities;
- Growth management programs;
- Land and facilities for housing, public works, or sources;
- Public facilities acquisition, construction, and rehabilitation;
- Other purposes that may prevent or mitigate impacts.

The bill would authorize for 4 years, $15 million a year for mitigation plan preparation and $135 million a year for public assistance grants and loans.

7.3.3 Impact Analysis

In March 1978, the President announced that executive agencies would be required to prepare urban and community impact analyses for major policy and program initiatives. The purpose of the analyses is to ensure that potentially adverse impacts of proposed Federal policies on cities, counties, or other communities be identified during the decision making process. Explicit in the mandate to

identify adverse impacts is the need for agencies to consider the analyses and in appropriate circumstances to propose, through terms and conditions, mitigating measures.

Instructions for preparation of urban and community impact analyses were issued to executive agencies in August 1978 by the Office of Management and Budget. The analyses are to address, among other things, impacts on employment (especially minority employment), population size and composition, income, and fiscal conditions of state and local governments. Absolute and relative impacts are to be considered, with long-term and short-term (under 3 years) impacts clearly differentiated.

Each analysis should be brief, approximately 15 to 20 pages with a 2- or 3- page executive summary. For proposed agency regulations, the analyses should be incorporated into the economic analyses required under Executive Order 12044. Impact analyses for legislative and budgetary proposals must be included in an agency's regular Congressional submissions.

# CHAPTER 8

## LONG-TERM ENVIRONMENTAL CONSEQUENCES OF COAL LEASING

8.1 Loss of Nonrenewable Resources

- 8.1.1 Coal as a Fossil Fuel
- 8.1.2 Soil
- 8.1.3 Biological Productivity
- 8.1.4 Topography
- 8.1.5 Archaeological and Historical Resources
- 8.1.6 Paleontological Resources
- 8.1.7 Water Losses
- 8.1.8 Labor/Manpower Commitment - Mine Construction and Operations
  - 8.1.8.1 Operational Worker Requirements - Surface and Deep Mines
  - 8.1.8.2 Construction Worker Requirements - Surface and Deep Mines
  - 8.1.8.3 Indirect Support
  - 8.1.8.4 Program Requirements

8.2 Long-term Productivity Loss Versus Short-Term Uses of Public Lands

- 8.2.1 Trade-off Analysis of Multiple Uses of Public Lands
- 8.2.2 Time Frame of Coal Leasing

8.3 Adverse Impacts Which Cannot Be Avoided Should Program Be Implemented As Proposed

- 8.3.1 Physical Environment
- 8.3.2 Biological Environment
- 8.3.3 Socioeconomic Values

8.4 Irreversible and Irretrievable Commitments of Public Resources

8.5 Renewable Resources Commitments on Public Land

- 8.5.1 Productivity Losses
- 8.5.2 Wildlife
- 8.5.3 Value of Crops Lost Due to Mining

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# CHAPTER 8

# LONG-TERM ENVIRONMENTAL CONSEQUENCES OF COAL LEASING

## 8.1 LOSS OF NON-RENEWABLE RESOURCES

Some resources will be lost if Federal coal land is leased, explored, developed, or mined. These resources will be addressed in the following sections. Also, energy in the forms of petroleum products, gas, coal, and electricity would be expanded to mine, clean, and transport the coal. Approximately 4* percent of the Btu content of marketable coal is consumed for the operation of the mining equipment; 1.2* percent of the Btu content of the cleaned coal is consumed in coal cleaning and drying; 2.7* percent of the Btu content of transported coal is consumed in transportation. Appendix J summarizes the operating energy for the coal fuel cycle by stage and region for the years 1976, 1985 and 1990. Some materials used in manufacturing machinery, such as drag lines, power shovels, continuous mining machines, railroad spurs, and buildings, would not be recycled and, thus, would be lost.

### 8.1.1 Coal as a Fossil Fuel

The principal commitment in the Federal coal-leasing program is for the extraction of coal from the ground. Since coal is a nonrenewable resource, once it is mined and has been used, it cannot be replaced. The commitment to mine coal involves not only the coal

*Based on Btu equivalent.

that is mined, but the coal that is lost in the process. An average of about 85 percent of the coal resource can be recovered when area strip-mining methods are used. In contrast, only half of the coal, on the average, can be saved in underground mining, especially when seams are thick, as coal must be left to support the ground above the seam being mined.

Cumulative production of Federal coal from 1780 through 1977 amounts to 447,814,471 tons. An additional 15 to 50 percent of this cumulative production may have been wasted in the mining process. In 1977, Federal coal production was 96.6 million tons, which was 14 percent of the total production in the United States.

Table 8-1 shows the amounts of projected coal production by regions for the various alternatives. For the "worst case," high scenario, approximately 1,221 and 1,911 million tons of coal would be extracted from the ground in the years 1985 and 1990; and about 600 and 940* million tons, respectively, would be lost using current mining methods. Cumulatively, 16,830 million tons would be recovered between the years 1979 and 1990. The cumulative amounts for the medium and low scenarios are 14,840 and 12,410 million tons, respectively.

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*Based on DOE Alternative, 1985.

TABLE 8-1

COAL PRODUCTION SUMMARY COMPARISON
(millions of tons)

| REGIONS | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| | BASELINE | 1985 PROJECTIONS | | | | | | | | | | |
| Northern Appalachian | 176 | 208 | 212 | 217 | 208 | 212 | 217 | 212 | 212 | 210 | 211 | 212 |
| Central Appalachian | 207 | 203 | 204 | 176 | 179 | 205 | 179 | 206 | 205 | 192 | 211 | 203 |
| Southern Appalachian | 23 | 18 | 27 | 41 | 18 | 27 | 43 | 26 | 28 | 32 | 23 | 22 |
| Eastern Interior | 136 | 209 | 210 | 161 | 209 | 206 | 172 | 206 | 207 | 196 | 213 | 203 |
| Western Interior | 11 | — | 14 | 15 | 13 | 14 | 14 | 14 | 14 | 8 | 16 | 11 |
| Texas | 14 | 63 | 66 | 35 | 62 | 64 | 49 | 64 | 65 | 50 | 79 | 58 |
| Powder River | 37 | 150 | 205 | 300 | 150 | 205 | 275 | 205 | 205 | 225 | 184 | 205 |
| Green River-Hams Fork | 26 | 40 | 80 | 130 | 40 | 76 | 100 | 78 | 77 | 112 | 58 | 112 |
| Fort Union | 11 | 17 | 32 | 52 | 17 | 31 | 52 | 32 | 32 | 37 | 37 | 22 |
| San Juan River | 9 | 15 | 25 | 40 | 15 | 25 | 40 | 25 | 25 | 30 | 32 | 22 |
| Uinta | 10 | 15 | 30 | 45 | 15 | 30 | 45 | 30 | 30 | 35 | 29 | 26 |
| Denver-Raton Mesa | 2 | 2 | 5 | 10 | 2 | 5 | 10 | 5 | 5 | 6 | 8 | 6 |
| REGIONS | | | | | | | 1990 PROJECTIONS | | | | | |
| Northern Appalachian | 176 | 194 | 220 | 253 | 194 | 220 | 213 | 219 | 220 | 218 | 225 | 222 |
| Central Appalachian | 207 | 191 | 206 | 218 | 191 | 211 | 197 | 211 | 210 | 197 | 225 | 206 |
| Southern Appalachian | 23 | 16 | 25 | 40 | 16 | 26 | 42 | 26 | 26 | 30 | 14 | 15 |
| Eastern Interior | 136 | 275 | 320 | 280 | 276 | 332 | 290 | 314 | 328 | 285 | 381 | 313 |
| Western Interior | 11 | 12 | 15 | 14 | 13 | 25 | 27 | 19 | 24 | 10 | 35 | 10 |
| Texas | 14 | 73 | 86 | 100 | 74 | 119 | 99 | 116 | 116 | 59 | 111 | 80 |
| Powder River | 32 | 175 | 400 | 600 | 175 | 305 | 335 | 355 | 316 | 450 | 269 | 396 |
| Green River-Hams Fork | 26 | 70 | 120 | 175 | 67 | 99 | 119 | 101 | 104 | 150 | 63 | 150 |
| Fort Union | 11 | 22 | 42 | 82 | 22 | 51 | 95 | 47 | 51 | 52 | 54 | 23 |
| San Juan River | 9 | 25 | 50 | 75 | 25 | 59 | 77 | 55 | 58 | 60 | 63 | 58 |
| Uinta | 10 | 20 | 40 | 60 | 20 | 45 | 65 | 42 | 45 | 51 | 37 | 28 |
| Denver-Raton Mesa | 2 | 5 | 10 | 15 | 5 | 11 | 15 | 11 | 11 | 10 | 10 | 8 |

8.1.2 Soil

Wind and rain induced erosion will result in the loss of an inestimable amount of soil. Curtis (1974) studied three mineral watersheds in Kentucky and found little correlation between sediment yield and the amount of land disturbed. He concluded that methods of mining and handling the overburden are major factors which determine sediment yield.

The Surface Mining Control and Reclamation Act contains several provisions designed to control the amount of soil which would be irretrievably lost due to coal mining and reclamation activities. The mining operation shall minimize the disturbances to the quality of surface water, both during and after surface coal mining operations and during reclamation, by conducting surface coal mining operations so as to prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to stream-flow on runoff outside the permit area, but in no event shall contributions be in excess of requirements set by applicable State or Federal Law (Sections 515 (b) (10) (B) (i) and 516 (b) (9) (B)). The mining operation will insure that the construction, maintenance, and postmining conditions of access roads into and across the site of operations will control or prevent erosion and siltation (Section 515 (b) (17)). The mining operation shall place all excess spoil material resulting from coal surface mining and reclamation activities in such a manner that spoil

is transported and placed in a controlled manner in position for concurrent compaction and in such a way to assure mass movement (Section 515 (b) (22) (A)). The operator shall maintain a successful cover on topsoil, which is not replaced on a backfill area within a time short enough to avoid deterioration, so that the topsoil is preserved from wind and water erosion (Section 515 (b) (5)).

Section 816.16 (b) of the 21 July 1978 Draft Regulations prepared by the Department of Interior, Office of Surface Mining Reclamation and Enforcement (U.S. Department of the Interior, 1978hhh) for the enforcement of the Surface Mining Control and Reclamation Act requires that all surface drainage from the disturbed area be passed through a sedimentation pond before leaving the permit area. The amount of soil irretrievably lost will, therefore, depend upon the applicable effluent limitations and the amount of sediment retained in the ponds which is not suitable for topsoil (Section 816.15 (f) (4)). In Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming, total suspended solids limitations will be determined on a case-by-case basis, but must not exceed 45 mg/ℓ (maximum allowable) and 30 mg/ℓ (average daily value for 30 consecutive discharge days) based on a representative sampling. All other states must not exceed 70 mg/ℓ (maximum allowable) (Section 816.15 (b) (1)).

8.1.3 Biological Productivity

The amount of biological productivity which would be irretrievably lost due to coal mining activities will depend primarily upon premining

and postmining soil properties. In those areas which presently possess soils that have been depleted of nutrients by excessive cropping or by natural environmental forces, postmining productivities and production potentials may exceed those prior to mining. Postmining productivities and production potentials would obviously be lower in those areas where the postmining soils are inferior to premining ones.

Premining biological productivities of each coal region were presented in Chapter 4. The difference between premining and postmining productivities and production potentials can not be quantified due to an insufficient data base. The total amount of irretrievably lost productivity attributable to mining on prime farmland may not exceed that on non-prime farmland (excluding cropland) since legal constraints are stricter for the former (see Section 6.1.5). A trend in net productivity and potential production loss or gain could be determined during any of the coal leasing programs.

8.1.4 Topography

Original topographies would be irretrievably lost on all coal mined areas. Numerous qualitative provisions in the Surface Mining Control and Reclamation Act (SMCRA) and the 21 July 1978 Draft Permanent Regulatory Program regulations (DPRP) would be ultimately defined during permit review by the regulatory authority in conjunction with appropriate land use agencies; therefore, the

degree of topographic change could be determined by these agencies at that time. Some of the major regulations are presented next to illustrate the latitude of interpretation.

Except in cases where an industrial, commercial, agricultural, residential, or public facility (including recreational facilities) is approved as the postmining land use (SMCRA Section 515 (c) (3)), approximate original contours must be restored with all highwalls, spoil piles, and depressions eliminated unless:

(a) The operator demonstrates that material in the permit is insufficient to restore approximate original contours, then the operator shall attain the lowest practicable grade, but not more than the angle of repose, to provide adequate drainage and to cover all acid-forming and other toxic materials, in order to achieve an ecologically sound land use compatible with the surrounding region; or

(b) The operator demonstrates that due to volumetric expansion the amount of material is more than sufficient to restore approximate original contours; then the operator shall, after restoring approximate original contours, achieve an ecologically sound land use as in (a) above (SMCRA Section 515 (b) (3)). "Approximate original contour" means that the postmining surface configuration resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain (DPRP Section 701.5 (b)).

In cases where an industrial, commercial, agricultural, residential, or public facility use is proposed, the regulatory authority may grant a permit for surface mining without restoring approximate original contours after consultation with the appropriate land use planning agency(ies), if any, where the proposed postmining land use is deemed to constitute an equal or better economic or public use as compared with the premining use (SMCRA Section 515 (c) (3) (A)). The appropriate land use planning agencies include state and local ones (SMCRA Section 515 (c) (3) (C)).

The regulatory authority may issue a permit for mountaintop removal mining without restoring approximate original contours if the postmining land use is similar to that described in the previous paragraph (DPRP Section 785.15 (c)). Permits may be issued similarly for mining on steep slopes (slopes greater than $20^{\circ}$ or lesser slopes designated by the regulatory authority) (DPRP Sections 826.5 and 826.13).

8.1.5 Archaeological and Historical Resources

The worst case analysis of impacts on these resources would involve coal development activities taking place with no provision for cultural resource identification or protection. This would result in the loss of probably all of the archaeological and historical sites within the areas of direct impact of development-related activities. In reality, there will be a loss of some

unquantifiable number of sites within each region, but in no case should this loss involve a significant site or a significant assemblage of sites.

8.1.6 Paleontological Resources

Although significant fossil remains could easily be lost through mining and mining-related activities, the development of evaluatory criteria and guidelines for management of these resources could mitigate significant losses. Since these criteria and guidelines are still in the process of being developed, it is not possible at present to meaningfully estimate the extent of potential loss of this non-renewable resource.

8.1.7 Water Losses

Large volumes of water would be required as a result of leasing for coal mining and conversion in all coal regions; additional water would be required for conjunctive developments and the population associated with the coal mining and conversion industry. In water-short regions, the large volumes of water allocated to coal development and utilization would not be available for other uses and could affect agriculture, industrial, commerical, and residential uses. Water exists in sufficient quantities in the Appalachian and Eastern Interior Coal Regions to support coal development and utilization. In the Western Interior, Texas Gulf, San Juan, Unita, Fort Union, Green River, and Powder River Coal Regions sufficient water would be available on an annual basis, though shortages may occur during low flow periods. In the Denver-Raton Coal Region, water may not be available even on an annual basis.

Adverse impacts resulting from the interruption of aquifers during coal mining cannot be avoided, especially in areas such as the Powder River and Fort Union Coal Regions, where ground-water aquifers are interbedded with coal seams. Lowering of ground-water levels, drying up of springs and seeps, and reduction in stream flow may occur in areas near mines where aquifers are disrupted. Replacement of aquifers with unclassified overburden would alter ground-water flow patterns and could reduce the aquifer storage capacity.

Development of lakes and ponds, as a result of surface mining, would be unavoidable where thick coal seams with thin overburden layers were mined. Water use in the area could be adversely affected to the extent that stream flow will be depleted and there will be an increased loss of water by evaporation.

Increased mining will also create a potential for some unavoidable degradation of local and regional water quality. Construction and mining activities may result in increased erosion, runoff, and sedimentation. Acid mine drainage will occur, primarily in the eastern coal regions. The operation of coal conversion and combustion plants will produce many potential water pollutants including dissolved solids, ammonia, non-degradable organic compounds, oxygenated compounds, mercaptans and other sulfur compounds, cyanides, phosphates, and trace elements. Even with controls, some release of these substances will occur either directly into surface waters or ground water or indirectly as leachates from solid waste disposal sites. Consumptive uses could also increase salinity and concentrations of pollutants downstream from the point of diversion. An increased population associated with the coal mines and conversion plants will introduce increased salts, nutrients, organic materials, bacteria, fertilizers, pesticides, trace elements, heavy metals, etc., into surface waters, and could overtax existing sewage treatment facilities. Impacts to water quality would be

site specific and would depend on such factors as streamflow characteristics and present water quality. For plants and mines located near the upper reaches of streams where the flow is low, impacts on water quality could be significant.

A general scenic degradation will occur as a result of coal mining and conversion. Scenic rivers and other water related recreational activities may be adversely impacted. The waters themselves may be degraded or the land through which the water flows may be affected to such an extent that their aesthetic properties would be lost.

Since water is a renewable resource, short-term consumption should not greatly affect long-term availability. The construction of impoundments could result in an increased long-term availability of water. On the other hand, excessive withdrawal of the ground water, drainage modifications, and rendering large surface areas impervious could result in a lowering of ground-water levels and pressures which would reduce the long-term productivity of some aquifers. In the long-term, the water requirements for mines and associated plants would cease with the termination of operations. Water requirements for conjunctive developments, such as community expansion, need not end with the termination of mining or plant operations.

More significant long-term changes would result from a decline in water quality due to coal development. The long-term quality of the available water supply would probably decline due to the discharge of industrial and municipal wastes, the increased sediment load from construction-related activities, possible return-flow effects, and changing consumptive patterns, including construction of impoundments. A reduction in water quality could result in restrictions upon the productive uses of surface water and ground water. Decreased water quality would also have impacts on long-term biological productivity in streams and rivers.

8.1.8 Labor/Manpower Commitment— Mine Construction and Operations

8.1.8.1 Operational Worker Requirements--Surface and Deep Mines. Implementation of the preferred alternative will result in the creation of approximately 100,000 to 135,000 additional jobs in the underground and surface mining sectors of the coal cycle (excluding construction employment). Between 1985 and 1990, an additional 42,600 to 212,000 coal mining jobs must be filled to meet regional production projections (Table 5- ). Under the "No New Leasing Alternative", approximately the same level of operational workers will be required (96,000 to 135,000). By 1990, under the no leasing alternative, the level of additional mine operating workers needed is projected to range from 40,000 to 110,000 jobs.

8.1.8.2 Construction Worker Requirements--Surface and Deep Mines

Implementation of the preferred alternative is estimated to result in the need for 11,500 to 15,000 additional construction workers in the surface and deep mining sectors of the coal cycle. By 1990, an estimated additional 7,800 to 31,000 construction jobs must be filled to construct mine capacity sufficient to meet regional production goals.

8.1.8.3 Indirect Support

Based upon an indirect employment multiplier of 1.4, estimates of additional induced employment attributable to the mining sector of the coal cycle range from 156,000 to 210,000 workers. By 1990, the demand for additional induced workers is projected to range from 59,000 to 297,000 workers.

In addition, substantial capital investment will be required. As presented in the Activity Analysis, Tables 3.7 through 3.12, approximately 75 to 120 additional western surface and deep mines are projected to commence production by 1985. Equipment requirements include large numbers of trucks, draglines, etc., will also be required. By 1990, an estimated 50 to 70 additional mines will be in production.

8.1.8.4 Program Requirements

Implementation of a coal leasing program will place substantial additional demands upon DOI. These demands will be most visible in terms of additional staff necessary to comply with the detailed process of tract identification tract evaluation and nomination, lease sales, and follow on supervision to ensure compliance with leasing terms and regulatory constraints.

## 8.2 LONG-TERM PRODUCTIVITY LOSS VERSUS SHORT-TERM USE OF LANDS

### 8.2.1 Trade-Off Analysis of Multiple Uses of Public Lands

This section presents estimates of opportunity costs associated with development of western coal resources. Of primary importance is that when coal is developed, whether to meet local or national needs, other outputs from the land utilized for coal development must be at least temporarily foregone. This section discusses these foregone alternative outputs and presents estimates of monetary opportunity costs for each coal region.

Many changes will be associated with the development of coal resources, and in particular, surface mining, due primarily to the long-term nature of the land alteration. In many instances, the productive capacity of land has been totally destroyed through the employment of ecologically unsound mining practices. Further, past attempts to restore surface-mined lands do not provide reasonable estimates of productivity expected to remain on land surface-mined in the future.

Some of the costs associated with mining are borne by individuals in their way of life. These costs include adjusting to new social situations, and living with people whose habits and values are different from those previously encountered. There may be frustrations, problems, or reductions in social welfare for some long-time residents in the coal development areas. The quantification of these social costs is difficult because they occur external to markets; market-type observations about their intensity or extent are lacking.

The balance of this analysis focuses on monetary costs of trade-offs made if coal development occurs. It is limited to areas where at least partial market information exists.

The opportunity cost of coal production is equal to foregone outputs that could be obtained from the alternative employment of resources used. These resources include land and other natural resources, labor, and capital. Capital is a highly mobile resource with a national market. With respect to capital, there is very little difference at the margin between returns "with" coal development at a particular location versus "without" coal development. Labor tends to be geographically committed to a far greater degree than capital. Most workers tend to stay in one city or town for long periods of their lives; most usually move only when a substantial change occurs in their lives. Thus, if coal resource development were to decrease employment opportunities significantly, it would be necessary to consider that fact as one of the costs of development. This cost would then be added to other development costs to obtain the total costs of coal development.

When considering the opportunity cost of labor, we are assessing the value of labor resources in alternative productive uses. Labor resources would freely move within coal development areas and workers could freely choose their employment activity. It is likely that, given the high wages paid in the mining industry, opportunity costs for labor will be less than wages in coal mining and related activities.

Under these conditions, opportunity costs will be generated by those who could be employed in the coal mining industry but elect not to do so.

Land resources are totally fixed, both in location and amount. The opportunity costs of land resource use are the value of outputs foregone due to coal development. The most substantial opportunity costs occur in agricultural production. Surface mining will result in substantial losses in agricultural output per acre mined (Table 8-2). Values presented in Table 8-2 represent the annual gross revenue return per acre to the agricultural sector, by state. Some double counting is inevitable because sales within the farm sector are not netted out.[1] Double counting results in overestimation of the value of final agricultural products produced. The degree of overestimation is related to the interdependence of a region's agricultural sector with respect to both agriculture itself and also other sectors of the economy (e.g., trade, services, etc.).[2]

Although the opportunity cost estimates presented in Table 8-2 overstate the time level of such costs, they represent the maximum annual agricultural opportunity cost per acre of land used for production of coal. It is assumed that, in the foreseeable future, rehabilitated land will not yield agricultural output commensurate with pre-mining levels of

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[1] The use of the National input-output table or a regional I-O Table might be used to estimate intra-agricultural transactions.

[2] Input-output models could also be used in this case to estimate sales of other sectors to agriculture.

TABLE 8-2

VALUE OF ALL AGRICULTURAL PRODUCTS SOLD PER ACRE OF ALL LAND

| | |
|---|---|
| **Northern Appalachia** | |
| Pennsylvania | 52.24 |
| Ohio | 86.28 |
| West Virginia | 8.64 |
| Maryland | 97.94 |
| **Central Appalachia** | |
| West Virginia | 8.64 |
| Virginia | 37.70 |
| Kentucky | 49.33 |
| Tennessee | 35.28 |
| **Southern Appalachia** | |
| Tennessee | 35.28 |
| Georgia | 50.04 |
| Alabama | 34.59 |
| **Eastern Interior** | |
| Iowa | 176.52 |
| Illinois | 130.76 |
| Indiana | 113.09 |
| Kentucky | 49.33 |
| **Western Interior** | |
| Iowa | 176.52 |
| Missouri | 52.18 |
| Arkansas | 56.57 |
| Oklahoma | 36.23 |
| Kansas | 70.34 |
| Nebraska | 76.26 |
| **Texas-Gulf** | |
| Texas | 33.60 |
| Arkansas | 56.57 |
| Louisiana | 41.48 |
| **Powder River** | |
| Montana | 6.43 |
| Wyoming | 4.68 |
| **Green River - Hams Fork** | |
| Colorado | 4.14 |
| Wyoming | 2.58 |
| Idaho | 56.31 |
| Utah | 7.70 |
| **Fort Union** | |
| Montana | 14.95 |
| North Dakota | 26.34 |
| South Dakota | 9.91 |
| **San Juan River** | |
| Arizona | 1.03 |
| New Mexico | 1.56 |
| Colorado | 7.48 |
| Utah | 1.20 |
| **Uinta - Southwestern Utah** | |
| Colorado | 4.50 |
| Utah | 4.79 |
| **Denver - Raton Mesa** | |
| Colorado | 69.37 |
| New Mexico | 4.96 |

SOURCE: U.S. Census of Agriculture, 1974 dollars.

production. It is anticipated that, for each acre of land required for coal development in each region, the annual opportunity cost approximates the values presented in Table 8-2. The estimates presented can be refined in two specific ways.

First, by estimating a single value that can be compared to the total resource value of the coal, and second, by estimating values appropriate to the state within and production region that specify, for the community at-large, the opportunity costs resulting from foregone agricultural outputs as land resources are withdrawn from agriculture and utilized in the production of coal. To make the comparison of the total resource value of coal, it is necessary that the annual agricultural output per acre be converted to a measure of present value. In the course of future analyses, the present value of land used in coal production can be compared to the present value of land in agricultural production. To estimate the present value of land in agriculture, we have estimated the capitalized[1] value of land for each state within the production regions. The capitalized value assumes that the return to farmers as a result of agricultural productive activity is 100 percent of gross returns. This of course, is not true, but by making such an assumption we can estimate the upper bound for the opportunity costs of land in agriculture. Thus, this analytic framework also enables separate estimates of agricultural factor payments and expected values of agricultural opportunity costs. The upper limit of the present

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[1] Capitalized value is computed by dividing the yield of an investment which in this case is taken to be the average value of agricultural output per acre of all land) by the interest rate.

value of agricultural opportunity costs of land (not including externalities are presented in Table 8-3. The application of information on regional earnings in agriculture as a percent of the gross value of agricultural sales reduces the upward bias in the Table estimates. The resulting value is no longer an upper limit, but, rather, is an estimate of the average agricultural opportunity cost of land.

Regional agricultural earnings used in this analysis are estimated to equal 18 percent of the value of all agricultural products sold for all regions.[1] This is an approximation of the national average and has not been varied among the coal production regions. The loss of these earnings is an additional estimate of agricultural opportunity costs. The generation of information about the level of valued-added in agriculture for each coal production area will allow more specific estimates of agricultural earnings and accordingly, opportunity costs. Once calculated, these revised estimates will reflect the wide differences in the agricultural sectors of the coal producing areas.

To this point in the analysis, externalities (indirect effects) have not incorporated in the estimation of opportunity costs. The next step in the analysis is to examine the indirect consequences of reducing the agricultural land base within each coal region. Such reductions are external to the agricultural sector and are the result

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[1] Estimated as a simple average of data for Sector 3: meat, animals and miscellaneous livestock products and Sector 5: feed grains, and grass seeds Table C-1 in U.S. Water Resources, Guidelines 5: Regional Multipliers, January 1977.

TABLE 8-3

MAXIMUM AGRICULTURAL OPPORTUNITY COSTS OF MINING, SHOWING CAPITALIZED VALUE OF ALL AGRICULTURAL PRODUCTS SOLD PER ACRE OF ALL LAND*

| | |
|---|---|
| **Northern Appalachia** | |
| Pennsylvania | 522 |
| Ohio | 863 |
| West Virginia | 86 |
| Maryland | 980 |
| **Central Appalachia** | |
| West Virginia | 86 |
| Virginia | 377 |
| Kentucky | 493 |
| Tennessee | 353 |
| **Southern Appalachia** | |
| Tennessee | 353 |
| Georgia | 500 |
| Alabama | 346 |
| **Eastern Interior** | |
| Iowa | 1765 |
| Illinois | 1308 |
| Indiana | 1131 |
| Kentucky | 493 |
| **Western Interior** | |
| Iowa | 1765 |
| Missouri | 522 |
| Arkansas | 566 |
| Oklahoma | 362 |
| Kansas | 703 |
| Nebraska | 763 |
| **Texas-Gulf** | |
| Texas | 336 |
| Arkansas | 566 |
| Louisiana | 415 |
| **Powder River** | |
| Montana | 64 |
| Wyoming | 47 |
| **Green River - Hams Fork** | |
| Colorado | 41 |
| Wyoming | 26 |
| Idaho | 563 |
| Utah | 77 |
| **Fort Union** | |
| Montana | 150 |
| North Dakota | 263 |
| South Dakota | 99 |
| **San Juan River** | |
| Arizona | 10 |
| New Mexico | 16 |
| Colorado | 75 |
| Utah | 12 |
| **Uinta - Southwestern Utah** | |
| Colorado | 45 |
| Utah | 58 |
| **Denver - Raton Mesa** | |
| Colorado | 694 |
| New Mexico | 50 |

*Assumes interest rate of 10% - 1974 dollars.

SOURCE: The MITRE Corporation.

of interdependence in regional economies. It is assumed that surface mining will reduce output by the average capitalized value shown in Table 8-4 and that "regional final demand" will be also reduced by this amount. While external decreases in output in the agricultural sector are generated by coal mining, e.g., fewer farms result in reduced demand for tractors, in many instances these decreases may be offset by increased coal industry demand for comparable goods and services. The estimates presented in Table 8-4 represent the maximum total direct and indirect change in regional earnings resulting from the use of one acre of land for mining activities. From the estimates presented in Table 8-4, it is possible to estimate expected values of total capitalized agriculture opportunity costs including direct and indirect costs within a coal producing region. These estimates are presented in Table 8-5.

It must be emphasized that the agricultural opportunity costs presented are estimated for an average acre of land in each coal region regardless of current use and without knowing the precise location of potential mining activities.

TABLE 8-4

MAXIMUM DIRECT AND INDIRECT AGRICULTURAL OPPORTUNITY COSTS OF MINING

| | |
|---|---|
| **Northern Appalachia** | |
| Pennsylvania | 799 |
| Ohio | 1338 |
| West Virginia | 118 |
| Maryland | 1499 |
| **Central Appalachia** | |
| West Virginia | 126 |
| Virginia | 535 |
| Kentucky | 700 |
| Tennessee | 501 |
| **Southern Appalachia** | |
| Tennessee | 505 |
| Georgia | 715 |
| Alabama | 516 |
| **Eastern Interior** | |
| Iowa | 2524 |
| Illinois | 1831 |
| Indiana | 1663 |
| Kentucky | 725 |
| **Western Interior** | |
| Iowa | 2524 |
| Missouri | 809 |
| Arkansas | 855 |
| Oklahoma | 547 |
| Kansas | 1090 |
| Nebraska | 1068 |
| **Texas-Gulf** | |
| Texas | 501 |
| Arkansas | 798 |
| Louisiana | 606 |
| **Powder River** | |
| Montana | 90 |
| Wyoming | 68 |
| **Green River - Hams Fork** | |
| Colorado | 59 |
| Wyoming | 39 |
| Idaho | 805 |
| Utah | 116 |
| **Fort Union** | |
| Montana | 116 |
| North Dakota | 350 |
| South Dakota | 132 |
| **San Juan River** | |
| Arizona | 15 |
| New Mexico | 23 |
| Colorado | 109 |
| Utah | 117 |
| **Uinta - Southwestern Utah** | |
| Colorado | 65 |
| Utah | 69 |
| **Denver - Raton Mesa** | |
| Colorado | 1055 |
| New Mexico | 72 |

*Present sum of the capitalized value of all agricultural products sold per acre of all land from Table  and the indirect component; regional earnings dependent upon agricultural output per acre of all land.

**1974 dollars.

TABLE 8-5

ESTIMATED AGRICULTURAL OPPORTUNITY COSTS OF MINING

| | |
|---|---|
| **Northern Appalachia** | |
| Pennsylvania | 144 |
| Ohio | 240 |
| West Virginia | 21 |
| Maryland | 269 |
| **Central Appalachia** | |
| West Virginia | 22 |
| Virginia | 97 |
| Kentucky | 126 |
| Tennessee | 91 |
| **Southern Appalachia** | |
| Tennessee | 92 |
| Georgia | 129 |
| Alabama | 92 |
| **Eastern Interior** | |
| Iowa | 455 |
| Illinois | 329 |
| Indiana | 300 |
| Kentucky | 131 |
| **Western Interior** | |
| Iowa | 455 |
| Missouri | 146 |
| Arkansas | 154 |
| Oklahoma | 98 |
| Kansas | 197 |
| Nebraska | 192 |
| **Texas-Gulf** | |
| Texas | 89 |
| Arkansas | 143 |
| Louisiana | 110 |
| **Powder River** | |
| Montana | 17 |
| Wyoming | 12 |
| **Green River - Hams Fork** | |
| Colorado | 10 |
| Wyoming | 8 |
| Idaho | 144 |
| Utah | 21 |
| **Fort Union** | |
| Montana | 38 |
| North Dakota | 63 |
| South Dakota | 24 |
| **San Juan River** | |
| Arizona | 3 |
| New Mexico | 4 |
| Colorado | 20 |
| Utah | 3 |
| **Uinta - Southwestern Utah** | |
| Colorado | 12 |
| Utah | 13 |
| **Denver - Raton Mesa** | |
| Colorado | 190 |
| New Mexico | 13 |

* Includes capitalized values of regional agricultural earnings (direct plus indirect) per acre of all land.

**1974 dollars.

### 8.2.2 Time Frame of Coal Leasing

The present structure of the BLM coal resource leasing program is keyed to exhaustion of logical mining unit (LMU) reserves within a forty-year period. Other time dependent elements of the program include:

- Due diligence requirement - 10 years
- Initial lease term - 20 years
- Lease renewal term - 10 years

The average mine plan represents a 30 year extractive effort. The leasing program as presently structured represents both a long-term commitment of resources, e.g. 30-40 years, while, at the same time, constitutes a time stream of short-term productivity losses through the life of the lease. This occurs due to the fact that the entire mine area is not disrupted for the entire lease period. Rather, as areas are disturbed, they are reclaimed upon the completion of mining. The only exception would be areas committed to long-term use such as building sites, roads, etc.

Insofar as areas are reclaimed after use, the time period for which alternative uses are foregone and productivity losses experienced probably range between 5 and 10 years. More specific estimates of the length of productivity losses will rely upon highly site-specific information. If areas are reclaimed at rates comparable to present operations, and in conformance with SMCRA, other regulations and sound engineering/mining practices, there should not be substantial changes vis-a-vis the present duration of per-acre productivity losses.

## 8.3 Adverse Impacts Which Cannot Be Avoided Should Program Be Implemented As Proposed

### 8.3.1 Physical Environment

Some degradation of local air quality would unavoidably occur in all regions as a result of coal development. Some damage to plants, animals, and humans from air pollutants may be unavoidable. Some increase in sulfur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide, trace elements, hydrocarbons, and respirable particulates would occur in all regions even though emission controls were employed and air quality standards were enforced.

Large volumes of water would be required for coal development in all regions; additional water would be required for conjunctive developments, for the population associated with the development, and, in Western Regions, for reclamation. Water potentially exists in sufficient quantities in the Appalachian and Eastern Interior Regions to support development. In the Western Regions uncertainties about Indian water rights and the amount of water represented by presently existing rights complicate the determination of water availability. In the Powder River and Fort Union Regions, sufficient water would be potentially available on an annual basis (dependent upon resolution of Indian water rights) to support development; however, shortages may occur during some summer months of low flow years. Future changes in existing reservoir operations in both regions or construction of new reservoirs in the Powder River Region may be necessary to distribute the water

more evenly throughout the year. In water-short areas, large volumes of water allocated to coal development would not be available for other uses and could affect agriculture, industrial, commercial, and residential uses.

For aquifers that are interbedded with, or overlay or underlie coal beds, adverse impacts resulting from interruption of the aquifer during mining could not be avoided. Lowering of groundwater levels, drying up of springs and seeps, and reduction in streamflow could occur in an area around those mines where such aquifers were disrupted. The specific impacts would be site-dependent. Replacement of aquifers with unclassified overburden would alter groundwater flow patterns. If large quantities of groundwater were withdrawn from thick aquifers, some subsidence might result.

Development of lakes and ponds, at the completion of surface mining, could be unavoidable where thick coal beds with thin overburden layers were mined. Water use in the area could be adversely affected to the extent that this occurrence depleted stream flows and added to evaporative loss of water.

Construction and mining activities would result in increased erosion runoff and sedimentation. Acid mine drainage would occur, primarily in the Eastern coal regions; alkaline mine drainage would also occur, primarily in the Western regions. The potential for the generation of such pollutants and the resulting impacts would be highly site-specific. The operation of plants would produce many potential water pollutants including dissolved solids, suspended

solids, ammonia, non-degradable organic compounds, oxygenated compounds, mercaptans and other sulfur compounds, cyanides, phosphates and trace elements. Even with controls, some release of these substances would occur either directly into surface waters or groundwaters or indirectly through leachates from solid waste disposal sites. Consumptive uses could also increase salinity and concentrations of pollutants downstream from the point of diversion. Increased population associated with coal development would introduce increased salts, nutrients, organic materials, bacteria, fertilizers, pesticides, etc., into surface waters, and could overtax existing sewage treatment facilities. Impacts to water quality would be site-specific and would depend upon such factors as streamflow characteristics and present water quality. For plants and mines located near the upper reaches of streams where the flow is low, impacts to water quality could be significant.

Topography would be unavoidably altered by construction and mining activities. Construction activities could result in the filling of areas of low relief, the leveling of rolling terrain, the creation of slopes where no slopes previously existed, the removal of prominent points of land, the erosion of surface areas, and alterations to stream channels and drainage patterns. Mining activities, especially surface mining, would result in the disturbance of large surface areas; however, reclamation could, to a large extent, restore the topography so as to approximate pre-mining conditions in many areas. Subsidence of land could also unavoidably result from underground mining activities. In addition, any construction of impoundments could result in the

inundation of large areas of land and would completely alter the topography of such areas.

Mining and reclamation of surface mined areas would also alter the geology from the ground surface down to the base of the coal seams. This impact would be permanent and irreversible.

Reduction in the reserves of coal, which are essentially non-renewable mineral resources, would be an unavoidable adverse effect. Varying amounts of metals and of sand, gravel, clinker, and other types of aggregate material would be required for the construction of plants and conjunctive developments. An inestimable amount of some other mineral resources would be unavoidably lost to the extent that intermixing with coal mining spoils prohibits their economic recovery. Recovery of some other minerals may be pre-empted or delayed by coal development.

Surface mining and related activities would result in the disturbance of large areas of topsoil. On some of the areas to be stripmined, destruction of all soil horizons and alteration of soil characteristics that developed over long periods of geologic time may be unavoidable. Once mining was completed, backfilling and reclamation efforts could result in the mixing and compaction of soils and, possibly, the burying of the more fertile soils. As an end result, new soils may unavoidably be formed with characteristics quite different from those which existed prior to mining. Soil microorganisms present in the soil could also be unavoidably destroyed by such actions.

Once mining was completed and the area reclaimed or rehabilitated, soil development would start again. Soils that were denuded of vegetation would also be subject to increased erosion. These impacts would also occur to a lesser extent from the construction of any homes, highways, pipelines, and transmission lines.

The disposal of solid wastes generated by user industry, communities, and other conjunctive developments could result in the covering of productive soils. Leaching of toxic materials from waste disposal sites and coal spoil banks could adversely affect soil productivity. Any construction of reservoirs or impoundments could result in the inundation of productive soils.

### 8.3.2 Biological Environment

Development would affect ecological systems through the unavoidable disruption of habitats, food chains, predator-prey relationships, behavior patterns and various activities of species playing key roles in the ecosystem. Terrestrial ecosystems would be affected by land clearing activities, an increased presence of human activities in formerly remote areas, changes to air quality, and decreases in soil productivity. Aquatic ecosystems would be affected by changes to water quality, changes to stream hydrology, activities which cause dewatering of aquatic habitats, and the construction of reservoirs which would change riverine ecosystems to lacustrine ecosystems.

Existing vegetation would be destroyed on sites used for mining, solid waste disposal, community expansion, and conjunctive developments. In addition, increased populations in presently undeveloped areas of

the coal regions would intensify recreational activities which would destroy or decrease the vegetative cover on additional lands. Residuals from plant operations and conjunctive developments could also adversely impact vegetation. Reclamation would restore vegetation to some extent; however, reclamation efforts would not likely be completely successful on all areas, especially on some severely disturbed mine areas where low precipitation is coupled with infertile soil. In the drier areas of the West or in areas with high evapotranspirations rates, it is possible that many decades could pass before natural vegetation and soil conditions could be restored to disturbed areas, even with reclamation. In any area where reclamation was not successful, vegetation would be set back to a colonizing stage; natural revegetation would proceed extremely slowly and with difficulty in arid and semi-arid areas of the western coal regions. Desert areas not successfully reclaimed may take hundreds of years to recover. In the East, acid drainage could hinder revegetation efforts. Natural revegetation of an area may result in a species composition drastically different from that which existed prior to development. Reclamation efforts, on the other hand, may attempt to restore the original vegetative composition or may attempt to provide an entirely different mix of species.

Loss of habitat and reductions in population would occur as unavoidable consequences of the mining and utilization of coal. Some mortality and displacement of animals would occur in all regions. These losses would primarily involve birds, small mammals, reptiles,

amphibians and invertebrates; some big game species would also be affected.

Mining, transportation, and processing of coal would expose wildlife to various hazards and distrubances. Blasting, construction, and other noises associated with the mining activity would be unavoidable and would frighten away some wildlife species. Reproductive and migratory behavior could be affected.

Destruction of existing aquatic habitat and faunal species would occur where streams were altered by mining or construction or by new reservoirs. Reduction of water quality as a result of development would also adversely affect aquatic life. Increased sedimentation of waters could result in the elimination of those species which require clean gravel for spawning. Changes to or elimination of ponds, streams and potholes would also adversely affect waterfowl.

In many areas, wildlife would return following reclamation efforts, providing adequate water sources were available. The diversity, density and composition of the new populations would, in most cases, be altered from previous conditions.

8.3.3 Socioeconomic Values

The influx of a relatively large number of people into a region as a result of coal development would exert a major influence upon the region, primarily affecting existing communities located near the areas of development. A relatively large increase in population would, to some degree, change daily living patterns in impacted communities

and could result in increased social and economic problems in such communities. The potential impacts to a community would depend upon the relative size and the rate of population increases, the existing infrastructure, and the adequacy of any advanced planning for the growth.

Large, rapid population growth (hyperurbanization) could create severe socioeconomic problems. In small communities within the coal regions considered, large, rapid population influxes may be unavoidable, especially during the construction phase, due simply to the small, existing population base. A large, rapid population increase could create inflation, social tensions, and a shortage of housing and necessary public services and facilities. Those families not involved in the development-related expansion could be severely affected by any resultant inflation. Any lack of social services and public facilities would affect all residents. Health services, particularly, could suffer; facilities would require many years to be built, and medical personnel might not be easily attracted to rural areas. Provision of necessary services and facilities could also affect local tax rates. Furthermore, local governments could be hard pressed to raise the revenues required to expand services. Large population increases could also result in tensions between newcomers and the existing population. Because permanent population increases in a community may not warrant development of permanent facilities on a scale required to meet the needs of the population during the construction phase, many development-related impacts may be greater during the construction phase than during

the operational phase; by the time the operational population arrives, housing and many of the needed facilities and services could be available and would lessen potential impacts.

Coal development would require land for plant sites, mining sites, waste disposal sites, community development, roads, railroads, utility and pipeline corridors, and sites for other associated services, all of which would permanently alter some land use and temporarily alter other land use. Agricultural, grazing, forest and recreational lands would be removed from their existing uses. Furthermore, the loss of vegetation on development sites, in combination with the introduction of many humans and heavy equipment, would disrupt natural habitats, decreasing land available for wildlife communities.

The subsequent productive capacity of lands used for development may be reduced as a result of soil distrubance. Any decrease in productivity would depend upon the use to which the land was put during development and the success of any reclamation efforts. In addition, any loss of agricultural water rights in Western Regions through transfer to municipal and industrial uses could result in a permanent decrease in irrigated agricultural land.

Buildings, roads, utility corridors, waste disposal areas, etc., would unavoidably displace or intrude upon the natural landscape. Construction and mining activities could inadvertently disturb or destroy sites of archaeological, historical or paleontological value. Increased population and increased access to such sites could result

in increased visitation and vandalism. Increased populations could also result in increased pressures on state and Federal park and recreation systems and other recreational areas.

## 8.4 Irreversible and Irretrievable Commitments of Public Resources

This section provides a generic, qualitative summary of the long-term irreversible and irretrievable commitments of resources which would result from the Preferred-High Level Leasing Policy.

Coal would be irreversibly and irretrievably committed upon extraction. The quantity of coal which would be produced in each region is presented in Section 7.1.1, and the regional known coal reserves are discussed in Section 3.1.1.

Land used for plant sites, community expansion, and related transportation and distribution activities would probably not be returned to former uses. (Even when the plant ceases operation, the site would likely be used for other industrial or commercial purposes.) Land used for mining and for the disposal of solid wastes from plant operations may be committed to uses other than premining ones.

Energy, in the forms of petroleum products and electricity, would be expended to obtain coal.

Substantial quantities of steel, copper, aluminum, and wood would be permanently committed to plant operation. Materials used in manufacturing mining machinery and other construction equipment, which are not recycled, would be irretrievably lost.

Due to the nature of strip mining and, to some extent, underground mining activities, an inestimable quantity of topsoils would be mixed with or buried under mining wastes or lost through erosion.

If reclamation procedures were stringently adhered to, new soils would form over time; however, in some areas of the West, hundreds of years could be required for natural processes to reestablish fertile soils. Mining and other conjuctive developments would cause irreversible changes to the natural topography.

Those aquifers that would be drastically disturbed during mining or groundwater use may be irreversibly changed. If large quantities of groundwater were to be pumped from thick Tertiary and Cretaceous Age sand aquifers, subsidence could occur and irreversibly alter these aquifers. The chemical quality of water in some aquifers would be irreversibly changed, as for example, when freshwater beds are dewatered and later infiltrated by saline waters. Leachates from coal conversion and combustion facility solid wastes could also cause irreversible changes to groundwater quality.

Drainage patterns would be irreversibly changed by mining and construction activities. Changes in drainage could lead to irreversible alterations to surface water hydrology. Furthermore, the large amounts of water consumed by coal development would be diverted from other potential uses for long periods of time and would be irretrievably lost to these uses.

Fuels, electric power, lubricants, explosives, structural materials, capital, manpower and services required for coal development would be irretrievably lost to other uses. Large amounts of sand, gravel, clinker and other types of aggregate material would be used in the construction of mine and plant facilities and for other conjunctive developments and would not be recovered. Clinker, sand, and gravel deposits mined with the overburden and mixed with other spoil would also be irretrievably lost. An inestimable amount of mineral resources could also be irreversibly committed to the extent that dilution with coal mining spoils prohibits economic recovery. The operation of the plants would also irreversibly consume or change the physical or chemical form of process additives. These would include mineral additives, chemicals, catalysts, water treatment chemicals and petroleum products used to maintain and operate mechanical equipment.

On those areas reclaimed to premining vegetation, it is doubtful that total reestablishment of the native plant community would be possible, especially on severely disturbed mined areas. Strip mining and associated activities would eliminate a portion of this life support community which would result in an irreversible impact on flora and fauna in the area. Species diversity may be reduced. New ecosystems may be dominated by exotics.

Residents of rural and remote areas transformed into urban and

industrial centers would experience an irreversible change in their traditional life-styles. Distinct ethnic cultural values could be lost.

Labor needed to construct and operate the plants and conjunctive developments would be irretrievably lost to alternative uses during the period of operation. Agricultural labor drawn to coal development would be irretrievably lost to agriculture.

Fatal accidents would occur which are directly related to coal mining, construction or other job-related activities. Other losses of life would occur as a result of increased human interaction associated with population increases.

A considerable portion of land use changes would be permanent, since areas shifted to industrial and urban uses would likely remain committed to such uses. Agricultural, grazing and forest lands which could not be restored to former fertility would be irreversibly lost to such production levels.

Unidentified historical, archaelogical, and palentological sites destroyed by mining and construction activities would be irretrievably lost.

Less tangible values that would be irretrievably lost include areas of natural beauty or unique geologic significance.

## 8.5 Renewable Resources Commitments on Public Land

### 8.5.1 Productivity Losses

Total acreages removed from potential production and estimates of potential natural and agricultural productivities under the high production level of the preferred alternative by 1990 are given in Table 8-6. It is assumed that from 1990 on, these estimates would reflect yearly productivity lost from that acreage. Estimates of crop production lost are based on percents of current land use in each region devoted to the respective crops. Forest productivity losses refer to leaf, twig, bark, etc., production per year.

Timber losses (Tab. 8-7) reflect the number of board feet that would be lost if all of the estimated forest land disturbed was in the major timber species.

### 8.5.2 Wildlife

Potential wildlife losses (Tab.8-8) reflect estimates of the numbers of individuals by category that would eventually be removed due to habitat loss. Animal unit losses reflect the number of individuals that could potentially be supported if all of the disturbed acres were pasture or grazing land.

TABLE 8-6

- ESTIMATES OF LONG TERM PLANT PRODUCTIVITY LOST DUE TO PERMANENT LAND COMMITMENTS UNDER THE HIGH PRODUCTION LEVEL OF THE PREFERRED ALTERNATIVE

| Region | Total Land Disturbed (Acres) | PRODUCTIVITY LOSS* | | | | | | | | | WILDLIFE LOSS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeet (tons) | Oats (bu) | Hay (tons) | Range (tons) | Forest (tons) | Game Animals | Game Birds | Small Mammals | Song Birds | Amphibians/Reptiles | Predators | Animal Units |
| Northern Appalachian | 223935 | 2007825 | 442560 | - | 276425 | - | 78360 | 78760 | - | 1187735 | 15675 | 55000 | 2245000 | 775000 | 555000 | 445 | 102255 |
| Central Appalachian | 136830 | 551440 | 254330 | - | 33210 | - | - | 68855 | - | 755450 | 9575 | 35000 | 1365000 | 480000 | 340000 | 270 | 62485 |
| Southern Appalachian | 152050 | 646835 | 548115 | 971470 | - | - | - | 68315 | - | 810420 | 8395 | 35000 | 1250000 | 440000 | 310000 | 255 | 61995 |
| Eastern Interior | 94775 | 1467621 | 759330 | - | 225460 | - | - | 24505 | - | 220050 | 5685 | 15000 | 950000 | 330000 | 240000 | 195 | 55745 |
| Western Interior | 115505 | 1359155 | 380815 | 464120 | 502145 | - | - | - | 44705 | 408710 | 3465 | 20000 | 1160000 | 405000 | 290000 | 235 | 44425 |
| Texas | 152050 | - | - | 3376780 | 176770 | - | - | 40285 | 300640 | 522550 | 9125 | 25000 | 1515000 | 535000 | 535000 | 305 | 24145 |
| Powder River | 69385 | - | - | - | 61710 | 730 | 3210 | 3365 | 410775 | 10940 | 2810 | 2082 | 620000 | 70000 | 170000 | 135 | 4480 |
| Green River-Hams Fork | 45995 | 15865 | - | - | 18355 | 675 | 770 | 2790 | 64390 | 61310 | 945 | 7360 | 2530000 | 115000 | 210000 | 95 | 4945 |
| Fort Union | 26900 | - | - | - | 149595 | - | 46935 | 4600 | 99105 | 7775 | 1135 | 3766 | 240000 | 12000 | 65000 | 50 | 3275 |
| San Juan | 39340 | 7870 | - | 29200 | 13650 | 290 | - | 2485 | 63595 | 89054 | 60 | 9074 | 195000 | 95000 | 100000 | 115 | 3570 |
| Uinta | 23315 | 7605 | - | - | 8200 | 255 | - | 1245 | 25960 | 54370 | 240 | 4663 | 120000 | 55000 | 65000 | 50 | 2810 |
| Denver-Raton Mesa | 23710 | 66100 | - | 195 | 62565 | 1875 | - | 5265 | 146250 | 40355 | 360 | 4742 | 215000 | 55000 | 55000 | 50 | 1460 |

*Based on allocations of percents to major land uses in region.

TABLE 8-7

ESTIMATES OF POTENTIAL TIMBER LOSSES DUE TO PERMANENT LAND COMMITMENTS UNDER THE HIGH PRODUCTION LEVEL OF THE PREFERRED ALTERNATIVE

| REGION | FOREST TYPE | PRODUCTIVITY (THOUSAND BOARD FEET/ACRE) | ACRES OF FOREST PERMANENTLY REMOVED | THOUSAND BOARD FEET LOST |
|---|---|---|---|---|
| Northern Appalachia | Oak | 4.2 | 130,780 | 549,276 |
| Central Appalachia | Oak | 2.5 | 83,330 | 268,325 |
| Southern Appalachia | Pine | 2.3 | 87,620 | 201,526 |
| Eastern | Oak | 2.5 | 19,575 | 48,937 |
| Western | Oak | 2.5 | 25,670 | 64,175 |
| Texas | Pine | 4.0 | 54,660 | 218,640 |
| Powder River | Ponderosa Pine | 6.0 | 600 | 3,600 |
| Green River-Hams Fork | Englemann Fir/Spruce | 18.0 | 11,500 | 207,000 |
| Fort Union | Ponderosa Pine | 6.0 | 100 | 600 |
| San Juan | Ponderosa Pine | 10.0 | 18,250 | 182,500 |
| Uinta | Englemann Fir/Spruce | 18.0 | 7,930 | 142,740 |
| Denver-Raton Mesa | Ponderosa Pine | 10.0 | 5,100 | 51,000 |

TABLE 8-8
ESTIMATES OF LONG-TERM WILDLIFE LOSSES DUE TO PERMANENT LAND COMMITMENT
UNDER THE HIGH PRODUCTION LEVEL OF THE PREFERRED ALTERNATIVE

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 223,935 | 15,675 | 55,000 | 2,245,000 | 775,000 | 555,000 | 445 | 102,255 |
| Central Appalachia | 136,830 | 9,575 | 35,000 | 1,365,000 | 480,000 | 340,000 | 270 | 62,485 |
| Southern Appalachia | 152,050 | 8,395 | 35,000 | 1,250,000 | 440,000 | 310,000 | 255 | 61,995 |
| Eastern Interior | 94,775 | 5,685 | 15,000 | 950,000 | 330,000 | 240,000 | 195 | 55,745 |
| Western Interior | 115,505 | 3,465 | 20,000 | 1,160,000 | 405,000 | 290,000 | 235 | 44,425 |
| Texas | 152,050 | 9,125 | 25,000 | 1,515,000 | 535,000 | 535,000 | 305 | 24,145 |
| Powder River | 69,385 | 2,810 | 2,082 | 620,000 | 70,000 | 170,000 | 135 | 4,480 |
| Green River - Ham's Fork | 45,995 | 945 | 7,360 | 2,530,000 | 115,000 | 210,000 | 95 | 4,945 |
| Fort Union | 26,900 | 1,135 | 3,766 | 240,000 | 12,000 | 65,000 | 50 | 3,275 |
| San Juan | 39,340 | 60 | 9,074 | 195,000 | 95,000 | 100,000 | 115 | 3,570 |
| Uinta | 23,315 | 240 | 4,663 | 120,000 | 55,000 | 65,000 | 50 | 2,810 |
| Denver-Raton Mesa | 23,710 | 360 | 4,742 | 215,000 | 55,000 | 55,000 | 50 | 1,460 |

8.5.3 Value of Crops Lost Due to Mining

Estimates of the average value of agricultural output lost due to implementation of the alternative leasing strategies are presented in Tables 8.2.1-1 through 8.2.1-6. These estimates were generated through use of the agricultural opportunity cost methodology presented in Section 8.2.1. For each western coal region, the average per acre opportunity costs were applied to the estimates of cropland disturbed on a short term basis.

Opportunity cost esimates are presented for both 1985 and 1990. These costs represent the annual agricultural returns foregone due to coal production by region as presented in Tables 5. - .

Fort Union - Estimates of the agricultural opportunity costs in the Fort Union region in 1985 range from $95,400 to $196,600 annually. By 1990, opportunity costs are projected to range between $120,000 and $288,000 annually.

Powder River - Estimates of 1985 agricultural opportunity costs range from $5900 to $9500 on an annual basis. By 1990, annual opportunity cost estimates increase to between $7,200 and $19,300 per year.

Green River - Estimates of annual agricultural opportunity costs range from $1,400 to $3,500 in 1985. By 1990 estimated annual opportunity costs range from $1,900 to $4,600.

Uinta - Annual agricultural opportunity costs in the Uinta coal region are estimated to range between $900 and $1,100 in 1985. By 1990, estimates range between $200 and $1,700 annually.

San Juan - Annual estimated agricultural opportunity costs in 1985 are projected to range between $200 and $600. By 1990, estimates opportunity costs are projected to range between $470 and $900 per year.

Denver-Raton Mesa - Estimated annual agricultural opportunity costs are projected to range between $98,000 and $163,000 in 1985. By 1990, projected annual agricultural opportunity costs are expected to range between $155,000 and $254,300.

# CHAPTER 9

# CONSULTATION AND COORDINATION

9.1 Program Development Coordination

9.2 Environmental Statement Coordination

This document is a preliminary working draft of the Department of the Interior's Coal Management Environmental Statement. The document is intended for internal review purposes. It will be revised in response to reviewer comments. In addition, internal analysis and revision of materials are continuing.

# CHAPTER 9

# CONSULTATION AND COORDINATION

On July 25, 1977, a departmental news release informed the public that the Department of the Interior would do an environmental impact statement before adopting new coal management policies and procedures that carry out President Carter's directive to manage Federal coal lands in an environmentally sound manner. Subsequently, on September 27, 1977, the Federal District Court for the District of Columbia ordered the preparation of a draft supplemental environmental impact statement pursuant to the NRDC vs. Hughes decision. Since these events, numerous consultations and extensive coordination have taken place during the development of the Federal coal management program. This chapter indicates the procedure followed.

## 9.1 PROGRAM DEVELOPMENT COORDINATION

The groundwork for the program development was conducted by field and Washington personnel. Task groups composed of departmental employees of various agencies were formed in February 1978. The task groups' main responsibility was to identify issues and options which required a Department decision in order to develop a Federal coal management program. The primary issues and options were identified by May 1978. At the time, the task groups submitted issue/option papers to the Office of Coal Management, Bureau of Land Management in Washington. Also occurring during this time period was the field testing of criteria for designating lands unsuitable for surface coal mining. BLM state directors

were updated on this information via a briefing held in Denver on April 28, 1978. Representatives of the western states were updated via a briefing held in Washington on May 23, 1978, and a followup meeting with the states was held in Denver on June 8 and 9, 1978.

The content of the issue/option papers was coordinated internally with various departmental organizations during June 1978. The papers were reviewed for accuracy by the Bureau of Land Management prior to submittal to the Department's Office of Coal Leasing, Planning and Coordination. On June 30, 1978, the Secretary indicated his preference for the program based on the major issues presented. Program development was coordinated with the western states by a Denver based departmental coordinator for the Assistant Secretary, Land and Water Resources.

In addition to the program development coordination described above, the Bureau of Land Management conducted interagency consultations concerning jurisdiction. Coordination occurred between (1) BLM and the Fish and Wildlife Service concerning wildlife management responsibilities, and (2) BLM, Geological Survey, and the Office of Surface Mining concerning coal mining management responsibilities. The Minerals and Geology staff of the U.S. Forest Service provided assistance to the Department in the development of the issue papers. Memoranda of understanding are being completed to specify each agency's responsibility.

## 9.2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION COORDINATION

This section specifies the environmental impact statementment preparation consultations and coordination since the original Final Coal Leasing Programmatic Environmental Impact Statement was published on September 19, 1975.

Consultation efforts for this document commenced with a departmental news release on November 17, 1977, which requested the public to comment on the original final environmental impact statement. Table 9.1 lists the parties who commented. These comments were considered prior to the preparation of this document.

Thereafter, BLM negotiated a contract with MITRE Corporation to assist in the preparation of this statement. This contract was let on April 14, 1978. Subsequently, MITRE and the Department of the Interior consulted with the organizations listed on Table 9.2 to obtain environmental input.

TABLE 9.1

COMMENTORS ON 1975 FINAL LEASING
PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

FEDERAL GOVERNMENT AGENCIES

Army Corps of Engineers

Environmental Protection Agency

Tennessee Valley Authority

Department of Interior

Bureau of Mines

Bureau of Reclamation

STATE AND LOCAL GOVERNMENTS

Alaska Intergovernmental Clearinghouse

Arizona Intergovernmental Clearinghouse

Colorado Office of the Governor

Colorado Department of Natural Resources

Colorado Geological Survey

Colorado Division of Planning

Colorado Department of Highways

Colorado Governor's Socioeconomic Impact Office

Colorado Department of Health

Colorado Division of Mines

Colorado Board of Land Commissioners

Colorado Division of Wildlife

Delaware Intergovernmental Clearinghouse

Delaware River Basin Commission

Idaho Intergovernmental Clearinghouse

Iowa Intergovernmental Clearinghouse

Louisiana Department of Natural Resources

Lower Colorado River Authority

New Mexico Energy Resources Board

Mississippi Intergovernmental Clearinghouse

North Carolina Intergovernmental Clearinghouse

North Dakotá Intergovernmental Clearinghouse

North Dakota Game and Fish Department

North Dakota Public Service Commission

Northern Tier Regional Planning and Development Commission,
Towanda, Pa.

Oregon Intergovernmental Relations Division

Powder River Basin Resource Council

Susquehanna River Basin Commission

Tennessee Intergovernmental Clearinghouse

Texas Department of Water Resources

State of Virginia

West Virginia Intergovernmental Clearinghouse

Tri-County Planning Office, New Castle, Wyoming

Tri-County Regional Planning Office, Harrisburg, Pa.

Utah Office of the Governor

State of Wyoming

Wyoming Game and Fish Department

INDUSTRY

American Mining Congress

Arch Mineral Corporation

Arizona Public Service Company

Central and Southwest Corporation

Coastal States Energy Company

Commonwealth Edison Company

Energy Fuels Corporation

Freeman United Coal Mining Company

Mono Power and Resources Company

Kansas City Power and Light Company

WYMCO, Incorporated

Western Fuels Association, Incorporated

Western Energy Company

WESCAR, Incorporated

Utah International, Incorporated

Sunoco Energy Development Co.

Southern California Edison Co.

Santa Fe Industries

Salt River Project

Rocky Mountain Energy Co.

Peabody Coal Co.

Natural Gas Pipeline Company of America

National Coal Association

PRIVATE INDIVIDUALS AND ORGANIZATIONS

Aiken Audobon Society

Lucille Bawbridge

Capital Legal Foundation

Citizen's Coal Project Environmental Policy Institute

Citizen's for a Better Environment

Paul Clar

John Cochran

Colorado Open Space

David Ellis

Environmental Defense Fund

Dwight Filley

Friends of the Earth

The Human Side of Coal Energy Development

Page T. Jenkins

William A. Kint

Karen Kleehammer

Patty Kluver

Susan Light

McCone Agricultural Protection Organization

Natural Resources Defense Council

Northern Plains Resource Council

Jay Owne

William Palmer

Henry F. Pohlman

Melinda Reed

K. Bruce Robinson

Rosebud Protection Association

Robert Sanders

Sierra Club, North Dakota Group

Society of Vertebrate Paleontology

Dean B. Suagee

Surface Mining Research Library

Roland C. Townsend

Tri-County Ranchers Association

TABLE 9.2

CONSULTATIONS BY MITRE CORPORATION

FEDERAL GOVERNMENT AGENCIES

Advisory Council on Historic Preservation

Office of the General Counsel

Interstate Commerce Commission

Department of Agriculture

Division of Forestry, Forest Sciences Laboratory, Logan, Utah

Economic Research Service

Forest Service

Land Inventory and Monitoring Division

Livestock and Range Research Station, Miles City, Montana

Northeast Forest Experiment Station, Berea, Kentucky

Department of Commerce

Bureau of the Census, Population Division

Bureau of Economic Analysis

Economic Development Administration

Department of Energy

Argonne National Laboratory, Land Reclamation Office

Division of Coal

Division of Petroleum and Natural Gas

Division of Non-Ferrous Metals

Federal Energy Regulatory Commission

U.S. Department of Health, Education and Welfare

Health Resources Administration

National Institute of Occupational Safety and Health

Department of the Interior

Bureau of Land Management, Office of Coal Management

Heritage Conservation and Recreation Service, National Register Office; National Landmarks Group; Interagency Archaeological Services

Geological Survey

Department of Justice

Law Enforcement Assistance Adminstration

Department of Labor

Bureau of Labor Statistics, Wholesale Price Index Division

Mine Safety and Health Administration

Department of Transportation

Federal Railroad Administration

Environmental Protection Agency

Municipal Operations Branch

Region IX

Water Resources Council

STATE AND LOCAL GOVERNMENTS

Alabama Division of State Parks

Alabama Forestry Commission

Arizona State Parks

Arizona, University of

School of Renewable Natural Resources

Arkansas Department of Parks and Tourism

California Air Resources Council

Colorado Air Pollution Control Board

Colorado Department of Natural Resources

Division of Mine Land Reclamation

Division of Parks and Outdoor Recreation

Georgia Department of Natural Resources

Parks and Historical Sites Division

Idaho Department of Parks and Recreation

Illinois Department of Conservation

Illinois Department of Mines and Minerals

Land Reclamation Division

Indiana Department of Natural Resources

Division of State Parks

Iowa Department of Soil Conservation

Division of Mines and Minerals

Iowa State Conservation Commission

Iowa State University

Kansas Foresty, Fish and Game Commission

Kansas State Park and Resources Authority

Kentucky Air Pollution Control Board

Kentucky Division of Parks

Louisiana Department of Wildlife and Fisheries

Louisiana State Park and Recreation Commission

Missouri Department of Conservation

    Forestry Division

Missouri Department of Natural Resources

    Division of Parks and Recreation

    Land Reclamation Program

Montana Department of Fish and Game

    Recreation and Parks Division

Montana Department of State Lands

    Reclamation Division

Nebraska Game and Parks Commission

New Mexico Bureau of Mines and Mineral Resources

New Mexico State Park and Recreation Commission

North Dakota Park Service

North Dakota Public Service Commission

Ohio Department of Parks and Recreation

  Division of Natural Resources

Oklahoma Department of Mines

Oklahoma Department of Wildlife Conservation

Oklahoma Division of State Parks

Pennsylvania Department of Environmental Resources

Bureau of State Parks

South Dakota Department of Game, Fish and Parks

Division of Parks and Recreation

State Council of Governments

Tennessee Department of Conservation

Division of State Parks

Texas Forest Service

Texas Parks and Wildlife Department

Parks Division

Texas Railroad Commission

Surface Mining Department

Utah Department of Natural Sources

Oil, Gas, and Mining Division

Division of Parks and Recreation

Division of Wildlife Resources

Utah State Forester Office

Virginia Department of Conservation and Economic Development

Division of Parks

West Virginia Department of Natural Resources

Division of Parks and Recreation

West Virginia University

School of Forestry

Western Interstate Energy Board

Wyoming Department of Environmental Quality

Land Quality Division

Wyoming Department of Revenue and Taxation

Wyoming Game and Fish Department

Wyoming Recreation Commission

INDUSTRY

American Mining Congress

Bituminous Coal Operators' Association

Burlington Northern Railroad

Chicago and North Western Transportation Company

Kemmerer Coal Company

National Coal Association

Utah Power and Light Company

PRIVATE INDIVIDUALS AND ORGANIZATIONS

Geraghty and Miller, Incorporated

Hunter, Tom

Jansen, Dr. Ivan J.

Los Alamos Scientific Laboratory

National Geographic Society

Schiff, Dr. Daniel

Society of American Foresters

Three types of consultation occurred during draft environmental impact statement preparation. Specifically, these were the circulation of the draft environmental statement outline, the coordination with the Department of Energy to determine coal production level scenarios, and the circulation of copies of the preliminary draft environmental statement (PDES). The Format Outline For Coal Programmatic DES, was made available to the general public upon request via a Federal Register notice on July 31, 1978. The alternative leasing production level scenarios, which serve as the basis for impact analysis in Chapter 5, were coordinated by the Department's Office of Policy Analysis with the Department of Energy. Lastly, the preliminary draft environmental statement, which represented a "first cut" effort of the draft environmental statement, was distributed to selected agencies for comment. The distribution list included both departmental and non-departmental organizations. In addition to the Department agencies, the Department of Energy, U.S. Forest Service, and western state governors' offices recieved preliminary draft environmental statement copies with requests for written comments.

All preliminary draft environmental statement comments which were submitted in a timely manner were considered prior to draft environmental statement printing. Where appropriate, the preliminary draft environmental statement was modified to reflect these comments.

This draft environmental statement was distributed to a wide range of individuals and organizations. The list is too lengthly to

include in this statement, involving well over 1,000 names. It does, however, include those parties listed in Table 9.1, all 50 state clearinghouses, and the Federal agencies listed in Table 9.3.

TABLE 9.3

FEDERAL AGENCIES REQUESTED TO COMMENT ON THE DRAFT ENVIRONMENTAL STATEMENT

Advisory Council on Historic Preservation

Department of Agriculture

- Soil Conservation Service
- Forest Service

Department of Commerce

Department of Defense

- Army Corps of Engineers

Department of Energy

Department of Health, Education, and Welfare

Department of Housing and Urban Development

Department of the Interior

- Bureau of Mines
- Bureau of Reclamation
- Fish and Wildlife Service
- Geological Survey
- Heritage Conservation and Recreation Service
- National Park Service
- Office of Surface Mining

Department of Labor

Mining Safety and Health Administration

Occupational Safety and Health Administration

Department of Transportation

Environmental Protection Agency

Interstate Commerce Commission

National Historic Preservation Council

Office of Economic Opportunity

Office of Management and Budget

Water Resources Council

All substantive comments will be analyzed to determine revisions necessary to strengthen and improve this statement. Where appropriate, the final environmental statement will reflect consideration given to these comments.

In addition to written comments, the final Statement will reflect, where appropriate, any substantive comments that may surface during the draft environmental impact statement hearing process. It should be noted that hearings on the draft environmental impact statement are anticipated during the 60 day period following the release of this document. _____, _____, _____,..., and _____ are the anticipated hearing locations.

# APPENDIX A

# FEDERAL COAL MANAGEMENT PROGRAM

## EXAMPLE REGULATIONS

GROUP 3400 - COAL LEASING

PART 3400 - COAL MANAGEMENT - GENERAL

Subpart 3400 - Introduction - General

§ 3400.0-3 Authority.

§ 3400.0-5 Definitions.

§ 3400.1 Multiple development.

AUTHORITY: 30 U.S.C. 181 et seq: 30 U.S.C. 351-359; 30 U.S.C. 1201 et seq.; 42 U.S.C. 7101; and 43 U.S.C. 1701 et seq.

§ 3400.0-3 Authority.

These regulations are issued under the authority of:

(a) The Mineral Leasing Act of February 25, 1920, as amended (30 U.S.C. 181 et seq.).

(b) The Mineral Leasing Act for Acquired Lands of August 7, 1947, as amended (30 U.S.C. 351-359).

(c) Department of Energy Organization Act of August 4, 1977 (42 U.S.C. 7101 et seq.).

(d) Federal Land Policy and Management Act of 1976, October 21, 1976 (43 U.S.C. 1701 et seq.).

(e) Surface Mining Control and Reclamation Act of 1977, August 3, 1977 (30 U.S.C. 1201 et seq.).

(f) Multiple Mineral Development Act of August 13, 1954 (30 U.S.C. 521-531).

§3400.0-5 Definitions.

As used in these regulations;

(a) "Sole party in interest" means a party who is and will be vested with all legal and equitable rights under a lease, license, bid, or an application for a lease or license. No one is, or shall be considered, a sole party in interest with respect to a lease, license, or bid in which any other party has any of the interests described in this Group. "Interest" in the lease, license or bid, includes record title interests, overriding royalty interests, working interests, operating rights or options, or any agreements covering such "interest." Any claim or any prospective or future claim to an advantage or benefit from a lease or license, and any participation or any defined or undefined share in any increments, issues, or that may be derived from or that may accrue in any manner from the lease or license based on or pursuant to any agreement or understanding existing when the application filed or entered into while the application or bid is pending, is an interest in such lease or license.

(b) "Mining Supervisor" means the Mining Supervisor of the Geological Survey for the region in which the lands under license or lease are situated.

(c) "Rule of approximation" applies where an application embraces an acreage in excess of the acreage limitation; it may be allowed for the excess acreage if exclusion of the smallest legal subdivision involved would result in a deficiency which would be greater than the excess resulting from the inclusion of such subdivision.

(d) "Logical Mining Unit (LMU)" means an area of coal land that can be developed and mined efficiently and economically with regard to the conservation of coal reserves and other resources. An LMU may consist of one or more Federal leaseholds, and may include intervening or adjacent non-Federal lands, but all lands in an LMU must be contiguous, under the effective control of a single operator, and operated as unified operation with complete extraction of the LMU reserves within 40 years from the first approval of a mining plan for that LMU. In this paragraph "contiguous" shall mean having at least one point in common. No LMU shall exceed 25,000 acres, including both Federal and non-Federal coal deposits.

(e) "Logical Mining Unit (LMU) Reserves" means coal reserves equal to the sum of (1) estimated recoverable reserves under Federal lease in the LMU, and (2) estimated non-Federal recoverable reserves in the LMU. The LMU reserves associated with a Federal lease are the LMU reserves estimated as of the effective date of the LMU, of which that lease is a part, except that the LMU reserves under both paragraphs (e)(1) and (2) of this section may be adjusted by the Mining Supervisor whenever he approves a modification of the LMU boundaries, whenever the lessee surrenders deposits subject to the LMU, or whenever significant new information becomes available about the amount of such reserves, including the time at which a mining plan is approved.

(f) "Diligent development" means (1) for any Federal coal lease issued after August 4, 1976, the timely preparation for an initiation of coal production from the LMU of which the lease is a part so that coal is actually produced in commercial quantities by the end of the tenth year from the effective date of the lease. For this paragraph (f)(1), commerical quantities means one percent of the LMU reserves per year.

(2) For any coal lease issued before August 4, 1976, the timely preparation for and initiation of coal production from the LMU so that coal is actually produced in commerical quantities before June 1, 1986, except that the period of time during which production of coal in commerical quantities must be achieved may be extended as provided in 43 CFR 3405.3. In this paragraph (f)(2), commerical quantities means one-fortieth of the LMU reserves per year.

(g) "Continued operation" means the production of coal in the amount of one percent of the LMU reserves for each of the first two years following the achievement of diligent development, and an average amount of one percent of the LMU reserves associated with the lease thereafter. The annual average amount shall be computed on a three year basis, and the three-year period for which the average shall be computed shall consist of the year in questions and the two preceding years.

(h) "Governmental entities" means Federal and State agencies, municipalities and their subdivisions, including and corporation acting primarily as an agency or instrumentality of a State, which produces electrical energy for sale to the public.

(i) "Public bodies" means governmental entities and rural electric cooperatives and similar types of organizations, and nonprofit corporations controlled by any such entities.

§3400.1 Multiple Development.

The granting of a permit, license, or lease for the prospecting, development, or production of deposits of any one mineral will neither preclude the issuance of other permits or leases for the same land for deposits of other minerals with suitable stipulations for simultaneous operation, nor preclude the allowance of applicable entries, locations, or selections of leased lands with a reservation of the mineral deposits to the United States.

Subpart 3401 - General Coal Management Provisions and Limitations

Secs.

3401.1 Lands subject to leasing.

3401.2 Limited authority to lease.

3401.2-1 Department of Defense lands.

3401.2-2 Department of Agriculture lands.

3401.2-3 Consent of administering agency.

3401.2-4 Trust protection lands.

3401.3 Land description requirements.

3401.3-1 Land description in application.

3401.3-2 Land description in lease.

3401.4 Effect of transactions.

3401.4-1 Land disposal with a reservation of minerals.

3401.4-2 Effect of conveyance to state or local entities.

3401.5 Cancellation or forfeiture.

3401-5-1 Cancellation or forfeiture for cause.

3401.5-2 Protection of bona fide purchaser.

3401.5-3 Sale of underlying interests.

3401.6 Future interest, acquired lands.

AUTHORITY: 30 U.S.C. 181 et seq. & 30 U.S.C. 351-359

Subpart 3401 - General Coal Management Provisions and Limitations

§3401.1 Lands subject to leasing.

The Secretary may issue coal leases on all lands owned by the United States except lands in the:

(a) National Park System;

(b) National Wildlife Refuge System;

(c) National Wilderness Preservation System;

(d) National System of Trails;

(e) Wild and Scenic Rivers System, including study rivers designated under section 5(a) of the Wild and Scenic Rivers Act;

(f) Incorporated cities, towns, and villages; and

(g) Tide lands, submerged coastal lands within the Continental Shelf adjacent or littoral to any part of land within the jurisdiction of the United States.

(h) Lands by the United States for the development of mineral deposits, for foreclosure or otherwise for resale, or reported as surplus property pursuant to the provisions of the Surplus Property Act of 1944.

(i) Naval Petroleum Reserves, the National Petroleum Reserve in Alaska, and oil shale reserves.

(j) Custer National Forest.

§3401.2 Limited authority to lease.

§3401.2-1 Department of Defense lands.

The Secretary may issue coal leases with the consent of the Secretary of Defense on acquired lands set apart for military or naval purposes only if the leases are issued to a governmental entity which

(a) produces electrical energy for sale to the public;

(b) is located in the State in which the leased lands are located; and

(c) has production facilities in that State, and the coal produced from the lease will be used within that State.

§3401.2-2 Department of Agriculture lands.

(a) The Secretary may issue coal leases with the consent of the Secretary of Agriculture on National Forest System lands.

(b) The Secretary may issue coal leases that authorize surface coal mining operations on Federal lands within a national forest where:

(1) he finds that there are no significant recreational, timber, economic or other values which may be incompatible with the surface mining operations; and

(2) either (A) the surface operations are incident to an underground coal mine; or (B) the Secretary of Agriculture determines (on lands west of the 100th meridian that do not have significant forest cover) that surface mining complies with the Multiple-Use Sustained Yield Act of 1960, the Federal Coal Leasing Amendments Act of 1975, the National Forest Management Act of 1976, and the Surface Mining Control and Reclamation Act.

§3401.2-3 Consent of administering agency.

Leases for land, the surface of which is under the jurisdiction of any Federal agency other than the Department of the Interior, may be issued only with the consent of the head or other appropriate official of the executive Department, independent establishment, or instrumentality having jurisdiction over the lands containing the deposits, or holding a mortgage or deed of trust secured by such lands. Exploration licenses for such lands shall be subject to such conditions as that official may prescribe with respect to the use and protection of the nonmineral interests in the lands. The issuance of an exploration license shall not vest in the licensee an exclusive right to exploration or a preference right to a lease under this part.

§3401.2-4 Trust protection lands.

The regulations in Group 3400 of Title 43 CFR do not apply to the leasing and development of coal deposits owned by Indians and subject to the trust protection of the United States. Regulations governing those deposits and found in 25 CFR chapter I.

§3401.3 Land description requirements.

§3401.3-1 Land description in application.

(a) Any application for a Federal coal lease or license shall include a complete and accurate description of the lands for which the lease or license is desired.

(1) If the lands have been surveyed under the public land rectangular system, each application shall describe the lands by legal subdivision or aliquot part thereof (but no less than 10 acres), section, township, and range.

(2) Where protracted surveys have been approved and the effective date has been published in the Federal Register, applications to lease lands shown on such protracted surveys and filed on or after the effective date, shall contain a description of the lands according to the section, township, and range shown on the approved protracted surveys.

(3) If the lands have not been surveyed on the ground and are not shown on the records as protracted surveys, applications shall describe the lands by metes and bounds, giving courses and distances between the successive angle points on the boundary of the tract, in cardinal directions except where the boundaries of the lands are in irregular form, and connected by courses and distances to an official corner of the public land surveys. In Alaska, the description of unsurveyed lands shall be connected by courses and distances to either an official corner of the public land surveys or to a traingulation station established by an agency of the United States such as the U.S. Geological Survey, the Coast and Geodetic Survey, or the International Boundary Commission, if the record position is available to the general public. For areas covered by skeleton township surveys, see §3401.3(a).

(b) If the lands are acquired lands which have not been surveyed under the rectangular system of public land surveys, and the tract is not within the area of the public land surveys, it shall be described as in the deed or other document by which the United States acquired title to the lands or minerals.

(c) If the desired land constitutes less than the entire tract acquired by the United States, it shall be described by courses and distances between successive angle points on its boundary tying by course and distance into the description in the deed or other document by which the United States acquired title to the land.

(d) In addition, if the description in the deed or other document by which the United States acquired title to the land does not include the courses and distance between the successive angle points on the boundary of the desired tract, the description in the application shall be expanded to include such courses and distances.

(e) Applications shall be accompanied by a map on which the desired lands are clearly marked showing their location with respect to the administrative unit or project of which they are a part. (It is not necessary to submit a map if the desired lands have been surveyed under the rectangular system of public land surveys, and the land description can be conformed to that system.)

(f) If an acquisition tract number has been assigned by the acquiring agency to the identical tract desired, a description by tract number will be accepted in the offer or application.

(g) If an offer or application includes any accreted lands that are not described in the deed to the United States, these accreted lands shall be described by metes and bounds, giving courses and distances between the successive angle points on the boundary of the tract, and connected by courses and distances to an angle point on the perimeter of the acquired tract to which the accretions belong.

§3401.3-2 Land description in lease.

(a) All lands in a public land survey system State shall be surveyed before a lease may be issued except in areas covered by a skeleton survey, i.e. Utah and Alaska, and the lease when issued shall be described by legal subdivision, or aliquot part thereof (but no less than 10 acres), section, township, and range.

(b) The survey of unsurveyed lands in public land survey system States shall be at the expense of the Government.

§3401.4 Effect of transactions.

§3401.4-1 Land disposal with a reservation of minerals.

(a) Where the lands included in a lease or license have been or may be disposed of with reservation of the coal deposits, a lessee or licensee must make full compliance with the law under which the reservation was made. See the Acts of March 3, 1909 (35 Stat. 844; 30 U.S.C. 81); June 22, 1910 (36 Stat. 583; 30 U.S.C. 83-85); December 29, 1916 (39 Stat. 862; 43 U.S.C. 291-301; June 17, 1949 (63 Stat. 200); June 21, 1949 (63 Stat. 214; 30 U.S.C. 54); March 8, 1922 (42 Stat. 415; 48 U.S.C. 377); and other laws authorizing such reservation.

(b) Any sale or conveyance of lands subject to the Mineral Leasing Act for Acquired Lands by the agency having jurisidication, shall be subject to any lease or license previously issued under that act.

(c) Acquired lands leases outstanding on August 7, 1947, and covering lands subject to the Mineral Leasing Act for Acquired Lands may be exchanged for new leases to be issued under the act subject, in each case, to such appropriate conditions as may be prescribed.

(d) When the coal is to be mined by other than underground mining techniques, the surface of the land is owned by a surface owner, and the lease is issued after August 3, 1977, the lessee shall comply with the terms of the valid written consent of the surface owner.

§3401.4-2 Effect of conveyance to State or local entities.

If the United States has conveyed the title to, or otherwise transferred control of the land surface containing the deposits to any State or political subdivision, agency, or its instrumentality, to a college, any other educational corporation, or association, or to a charitable or religious corporation or association, the party shall be notified by certified mail of the application for the license or lease. The agency shall be given a reasonable period of time within which to suggest any stipulations necessary for the protection of existing surface improvements or uses to be included in the license or lease stating the supporting facts, and within which to file any objections to its issuance. If this party opposes the issuance of the license or lease, the facts submitted in support must be carefully considered and each case separately decided on its merits. However, opposition is not a bar to issuance of the license or lease for the reserved minerals in the lands. In each case, the final determination on whether to issue the license or lease is based on the best interests of the public.

§3401.5 Cancellation or forfeiture.

§3401.5-1 Cancellation or forfeiture for cause..

Any Federal coal lease or license may be cancelled or forfeited for violation of the Act under which the lease or license was issued, violation of applicable Federal regulations, or violation of the terms of the lease or license.

§3401.5-2 Protection of bona fide purchasers.

(a) Cancellation or forfeiture for violation of provisions of the Mineral Leasing Acts shall not be apply if it affects adversely the title or interest of a bona fide purchaser of any lease, or the option to acquire a license, lease, interest, option, or license that was acquired and is held by a qualified person, association, or corporation in conformity with those provisions, even though the holdings of the person, association, or corporation from which the lease, interest, option, or license was acquired, or of his prodecessor in title (including the original lesses of the United States) may have been cancelled or forfeited or may be or may have been subject to cancellation or forfeiture for any such violation.

(b) Any party to any proceedings with respect to a violation of any provision of the Act, has the right to be dismissed promptly as a party by showing that he or she holds and acquired his or her interest as a bona fide purchaser without having violated any provisions of the Act. No hearing shall be necessary on such showing unless prima facie evidence is presented to indicate a possible violation on the part of the alleged bona fide purchaser.

(c) If during any such proceeding a party waives his or her rights under an existing lease to drill or to assign an interest thereto, or if such rights are suspended by order of the Secretary pending a decision, rental payments and time counted against the term of the leases involved shall be suspended as of the first day

of the month following the filing of the waiver or the Secretary's suspension until the first day of the month following the final decision in the proceeding or the revocation of the waiver or suspension.

§3401.5-3 Sale of underlying interests.

If in any proceeding to cancel or forfeit a lease, interest in a lease, option to acquire a lease (or an interest in the option), or a license acquired in violation of any of the provisions of the Act, the lease, interest, option, or license is cancelled or forfeited to the Government, and if there are valid options to acquire the lease or an interest in one that are not subject to cancellation, forfeiture, or compulsory disposition, this lease, interest, option, or license shall be sold to the highest responsible qualified bidder by competitive bidding, in a manner similar to that provided for in the offering of leases by competitive bidding subject to all outstanding valid interests therein and valid options pertaining thereto. If less than the whole interest in the lease, interest, option, or permit is cancelled or forfeited, the partial interest shall be sold in the same way. If no satisfactory offer is obtained as a result of the competitive offering of these whole or partial interests, they may be sold by other methods that the authorized officer finds appropriate. However, the terms must not be less favorable to the Government than those of the best competitive bid received.

§3401.6 Future interest, acquired lands.

(a) An application for a future interest lease filed less than one year prior to the date of the vesting in the United States of the present interest in the minerals will be rejected. Upon the vesting in the United States of the present possessory interest in the minerals, all applications for future interest leases outstanding at the time will automatically lapse. Only offers for a present interest lease will be considered after that time.

(b) It is not in the public interest to issue a permit or lease to any person who, upon issuance, holds less than a majority interest in the minerals or to the operating rights, therefore, such licenses or leases will not be issued.

Subpart 3402 - Qualification Requirements

Sec:

3402.1 Qualified applicants and bidders.

3402.1-1 Special qualification provisions.

3402.1-2 Maximum acreage limitation.

3402.2 Filing of qualification statements.

3402.2-1 Previously filed qualification statements.

3402.2-2 Contents of qualification statements.

3402.2-3 Special provisions, heirs and devisees (estates).

3402.2-4 Special provisions, public bodies.

AUTHORITY: 30 U.S.C. 181 et seq.

Subpart 3402 - Qualification Requirements

§ 3402.1 Qualified applicants and bidders.

A coal license or lease may be issued only to (a) citizens of the United States; (b) associations of citizens organized under the laws of the United States or of any State that are authorized to hold such interests by State statute and by the instrument establishing the association; (c) corporations organized under the laws of the United States or of any State, including a company or corporation operating a common-carrier railroad; and (d) public bodies, including municipalities.

§ 3402.1-1 Special qualification provisions.

(a) Each applicant or bidder for a lease shall show that with the area applied for, the applicant's interest(s) in Federal leases and applications, directly or indirectly, do not exceed in the aggregate the acreage limitation in section 3401.2-4.

(b) A mineral lease or license shall not be issued to a minor but leases or licenses may be issued to a legal guardian or trustee in his or her behalf. See 3402.5.

(c) Every company or corporation operating a common-carrier railroad shall make a statement that it needs the coal for which it seeks a license or lease for use on its own railroad, that it operates main or branch lines in the State in which the lands involved are located; that the aggregate acreage in the licenses, leases, and

applications in which it is interest directly or indirectly does not exceed 10,240 acres; and that it does not hold more than one license or lease for each 200 miles of its railroad lines served or to be served from such coal deposits. This requirement excludes spurs or switches, branch lines built to connect the lease coal with the railroad, and parts of the railroad operated mainly by power not produced by steam.

(d) Aliens may not acquire or hold any direct or indirect interest in licenses or leases, except that they may own or control stock in corporations holding license or leases if the laws of their country do not deny similar or like privileges to citizens of the United States.

If any appreciable percentage of the stock of a corporation is held by aliens who are citizens of a country denying similar or like privileges to United States citizens, its application shall be denied.

§ 3402.1-2 Maximum acreage limitation.

(a) (1) No person, association, or corporation, or any subsidiary, affiliate, or persons controlled by or under common control with such person, association, or corporation shall take, hold, own or control at one time Federal coal leases or applications on more than 46,080 acres in any one State, and in no case on more than 100,000 acres in the United States.

(2) No person, association, or corporation holding, owning, or controlling Federal coal leases or applications (individually or through any subsidiary, affiliate, or person under common control) on more than

100,000 acres in the United States on August 4, 1976, shall be required to relinquish any lease or applications held on that date. However, it shall not be permitted to take, hold, own, or control any furhter Federal coal leases or applications until such time as its holding, ownership, or control of Federal leases or applications has been reduced below 100,000 acres with the United States.

(b)(1) In computing acreage holdings or control, the accountable acreage of a party owning an undivided interest in a lease or permit shall be the party's proportionate part of the total lease and permit acreage. Similarly, the accountable acreage of a party owning an interest in a corporation or association shall be the party's proportionate part of the corporation's or association's accountable acreage. However, no person shall be charged with his or her pro rate share of any acreage holdings of any association or corporation, unless he or she is the beneficial owner of more than 10 percent of the stock or other instruments of ownership or control of such association or corporation.

(2) On acquired lands, if the United States owns only a fractional interest in the mineral resources of the lands involved, only that part of the total acreage involved in the lease, proportionate to the extent of ownership by the United States of the mineral resources, shall be charged as acreage holdings. The acreage embraced in a future interest lease is not be be charged as acreage holdings until the lease for the future interest takes effect.

§ 3402.2 Filing of qualification statements.

Each applicant or bidder for a Federal coal lease or license shall file a statement of his or her qualifications to hold the lease or license. The statement shall be filed with the application or bid or license. The statement shall be filed with the application or bid in the Bureau of Land Management State Office having jurisdiction over the lands. See subpart 1821 of this chapter.

§ 3402.2-1 Previously filed qualification statements.

Applicants or bidders who have previously filed qualification statements may submit either a reference to the record by serial number and the office where the previous statement is filed along with any appropriate amendments or a new complete qualification statement.

§ 3402.2-2 Contents of qualification statement.

(a) If the applicant or bidder is an individual, a signed statement setting forth the applicant's citizenship shall be submitted with each application or bid for a license or lease.

(b) If the applicant or bidder is an association or partnership, the application shall be accompanied by a certified copy of its articles of association or partnership, together with a statement showing (1) that it is authorized to hold leases; (2) that the member or partner executing the lease is authorized to act on behalf of the association or partnership in such matters; and (3) the names and addresses of all

members owning or controlling more than 10 percent of the association or partnership and their citizenship and holdings.

(c) If the applicant or bidder is a corporation, it must submit statements showing (1) the State of incorporation; (2) that it is authorized to hold coal leases or licenses; (3) names of the officers authorized to act on behalf of the corporation; (4) the percentage of the corporation voting stock and all of the stock owned by aliens or those having addresses outside of the United States; and (5) the name, addresses, citizenship, and acreage holdings of any stockholder owning or controlling 10 percent or more of the corporate stock of any class. If more than 10 percent of the stock is owned or controlled by or on behalf of aliens, or persons who have addresses outside of the United States, the corporation must provide their names and addresses, the amount and class of stock held by each, and to the extent known to the corporation or which can be reasonably ascertained by it, the facts as to the citizenship of each.

(d) Every applicant or bidder for lease or license shall submit at the time of filing a signed statement that the applicant is the sole party in interest in the application or bid, and the lease or license, if issued; if not, the applicant shall set forth the names of the other interested parties in the application or bid, a separate or joint statement shall be signed by them and by the applicant or bidder setting forth the nature and extent of the interest of each in the application or bid, the nature of the agreement between them, if oral, and a copy of such agreement if written. Such separate or joint statement of interest

and written agreement, if any, or a statement of the nature of such agreement, if oral, shall accompany the application or bid. Simultaneously, all interested parties shall furnish evidence of their qualifications to hold such interest in the lease or license.

(e) Where there is a legal guardian or trustee, the following shall be provided: a certified copy of the court order authorizing the guardian or trustee to act as such and to fulfill in behalf of the minor or minors all obligations of the lease or arising thereunder; statements by the guardian or trustee as to the citizenship and holdings of each of the minors and as to the trustee's own citizenship and holdings, including holdings for the benefit of other minors.

(f) All applications or bids shall be signed by the applicant, bidder, or their attorney-in-fact, and if executed by an attorney-in-fact shall be accompanied by the power of attorney and the applicant's own statement as to citizenship and acreage holdings unless the power of attorney specifically authorizes and empowers the attorney-in-fact to make such statements or to execute all statements which may be required under these regulations.

(g) Applications on behalf of a corporation must be accompanied by proof of the signing officer's authority to execute the instrument except in a case where an officer of a corporation signs an application on behalf of the corporation.

§ 3402.2-3 Special provisions, heirs and devisees (estates).

If an applicant for a license, an applicant for a preference right lease, or a successful bidder to a competitive lease dies before the license or lease is issued, the license or lease will be issued to the executor or administrator of the estate if the estate has not been probated; if probate has been completed, or is not required, to the heirs or devisees; and if there are minor heirs or devisees, to their legal guardian or trustee in the bidder's name, provided the following information has been filed:

(a) Where probate of the estate has not been completed: (1) evidence that the person, who as executor or administrator submits forms of lease and bond, has authority to act in that capacity and to sign such forms; (2) evidence that the heirs or devisees are the heirs or devisees of the deceased permittee, licensee, lessee, or successful bidder, and are the only heirs or devisees of the deceased; and (3) a statement over the signature of each heir or devisee concerning citizenship and holdings.

(b) Where the executor or administrator has been discharged or no probate proceedings are required, the following shall be filed:

(1) a certified copy of the will or decree of distribution, if any, and if not, a statement signed by the heirs that they are the only heirs of the permittee, licensee, lessee, or successful bidder, and citing the provisions of the law of the deceased's last domicile

showing that no probate is required; and (2) a statement over the signature of each of the heirs or devisees with reference to citizenship and holdings, except that if the heir or devisee is a minor, the statement shall be over the signature of the guardian or trustee.

§ 3402.2-4 Special provisions, public bodies.

(a) To obtain a lease on a tract set aside pursuant to 30 U.S.C. 201(a) a public body must submit:

(1) Evidence of the manner in which it is organized;

(2) Evidence that it is authorized to hold a lease;

(3) Evidence that the action proposed has been duly authorized by its governing body; and

(4) A definite plan to produce energy solely for its own use or for sale to its members or customers (except for short-term sales to others).

(b) To obtain a license to mine coal pursuant to 30 U.S.C. 208, a municipality must submit:

(1) Evidence of the manner in which it is organized;

(2) Evidence that it is authorized to hold a license; and

(3) Evidence that the action proposed has been duly authorized by its own governing body.

(c) To obtain a lease pursuant to 30 U.S.C. 352 on a tract of acquired lands set apart for military or naval purposes, a governmental entity must submit:

(1) Evidence of the manner in which it is organized, including the State in which it is located;

(2) Evidence that it is authorized to hold a lease;

(3) Evidence that the action proposed has been duly authorized by its governing body; and

(4) Evidence that it is producing electricity for sale to the public in the State where the lands to be leased is located.

(d) Where the material required in paragraphs (a), (b), and (c) of this section has previously been filed, a reference to the serial number of the record in which it has been filed, together with a statement as to any amendments, will be accepted.

S 3403 - Fees, Rentals, and Royalties

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Subpart 3403 - Fees, Rentals, and Royalties

S 3403.1 Payments.

S 3403.1-1 Form of remittance.

Remittances shall be submitted as cash, money order, check, certified check, bank draft or bank cashier's check.

S 3403.1-2 Where remitted.

(a) Unless otherwise directed by the Secretary, rentals under all leases issued under the act shall be paid to the Bureau of Land Management State Office having jurisdiction over the leased lands. See Subpart 1821 of this Chapter. All remittances to Bureau of Land Management offices shall be made payable to the Bureau of Land Management.

(b) Rentals and royalties on producing mining leases shall be paid to the Mining Supervisor. All remittances to Survey offices shall be made payable to the U.S. Geological Survey.

S 3403.1-3 When remitted.

First year rental shall be remitted at the time of filing applications for preference right leases. First year rental for competitive leases shall be required by decision. Thereafter, rental for all leases shall be required in accordance with the lease provisions.

S 3403.2 Fees.

§ 3403.2-1 General fee provisions.

Applications for emergency leases, exploration licenses, and lease modifications shall be accompanied by a filing fee of $250 for each application. Applications for approval of assignments, or of any instrument transferring a lease or interest therein, shall be accompanied by a filing fee of $25 for each application. Such fee shall be retained as a service charge even when an application is rejected or withdrawn in whole or in part. An application not accompanied by the filing fee shall not be accepted.

§ 3403.2-2 Exceptions from filing fee.

No filing fee is required for:

(a) Coal licenses to relief agencies; or

(b) Preference right lease applications.

§ 3403.3 Rentals and royalties.

§ 3403.3-1 Rentals.

(a) Annual rental per acre or fraction thereof for coal shall be not less than $3 during the continuance of the lease.

(1) On leases issued before August 4, 1976, the rental paid for any year shall be credited against the royalties for that year until the lease is readjusted.

(2) On leases issued or adjusted after August 4, 1976, rental payments may not be credited against royalties.

§ 3403.3-2 Royalties.

(a) Royalty rates will be determined on an individual case basis prior to lease issuance. Such rates will be set out in the notice of competitive lease offer.

(1) A coal lease shall require payment of a royalty of not less than 12-1/2 percent of the value of the coal removed from a surface mine.

(2) A coal lease shall require payment of a royalty of not less than 8 percent of the value of the coal removed from an underground mine, except that the authorized officer may determine a lesser amount if conditions warrant.

(3) The value of coal removed from a mine is defined for royalty purposes in 30 CFR 211.63.

(b) The Mining Supervisor shall have discretion, upon the request of the lessee, to authorize the payment of an advance royalty in lieu of continued operation for any particular year. The advance royalty for each lease shall be based on a percent of the value of a minimum number of tons of coal, and the percent shall not be less than the percent prescribed in that lease for the production royalty. For any lease issued after August 4, 1976, the maximum number of tons shall be determined on a schedule sufficient to exhaust the leased reserves in 40 years from the approval date of the LMU mining plan of which the lease is a part; for any lease issued before August 4, 1976, the minimum number of tons shall be determined on a schedule sufficient to exhaust the leased reserves in 40 years from June 1, 1976. Advance royalties shall not be paid for more than 10 years in all during the life of any lease, including the life of the lease after readjustment. No payment of an advance royalty during the first 20 years of a lease may be used as credit against production

(2) An application for any of the above benefits shall be filed in triplicate in the office of the Mining Supervisor. The application must contain the serial number of the leases, the BLM State Office name, the name of the record title holder and operator or sublessee, and the description of the lands in the manner provided by Section 3401.3.

(i) Each application shall include the number and location of each mine, a map showing the extent of the mining operations, a tabulated statement of the coal mined and subject to royalty for each month covering a period of not less than 12 months immediately prior to the date of filing of the application, and the average production per day mined for each month with complete information as to why the minimum production was not attained.

(ii) Every application shall contain a detailed statement of expenses and costs of operating the entire lease, the income from the sale of any lease products, and all facts indicating whether the mines can be successfully operated upon the royalty or rental fixed in the lease. Where the application is for a reduction in royalty, full information shall be furnished as to whether royalties or payments out of production are paid to others than the United States, the amounts so paid, and efforts made to reduce them.

(iii) The applicant shall also file a copy of agreements between the lease holders and royalty holders to a permanent reduction of all other royalties from the leasehold so that the total withheld will not be in excess of one-half the Government royalties.

(e) (1) Applications by lessees for relief from the producing requirements or from all operating and producing requirements of coal leases shall be filed in triplicate in the office of the Mining Supervisor. By Departmental Order No. 2699 and Geological Survey Order No. 218 of August 11, 1952, the Mining Supervisor is authorized to act on applications for suspension of operations or productions, or both, filed pursuant to this section and to terminate suspensions of this kind which have been or may be granted.

(2) The term of any lease shall be extended by adding any period of suspension of all operations and production during such term in accordance with any direction or assent of the Secretary.

(3) A suspension shall take effect as of the time specified in the direction or assent of the Secretary. Rental and minimum royalty payments will be suspended during any period of suspension of all operations and production directed or assented to by the Secretary, beginning with the first day of the lease month on which the suspension of operations and production becomes effective. If the suspension of operations and production becomes effective on any date other than the first day of the lease month, rental and minimum royalty payments shall be suspended beginning with the first day of the lease month following such effective date. The suspension of rental and minimum royalty payments shall end on the first day of the lease month in which operations or production is resumed. Where rentals are creditable against royalties and have been paid in advance, proper credit shall be allowed on the next rental or royalty due under the lease.

(4) No lease shall expire by reason of a suspension of either operations or production only, pursuant to any direction or assent of the Secretary.

(5) The minimum annual production requirements of a lease issued under the act shall be proportionately reduced for that portion of a lease year for which suspension of operations and production is directed or granted by the Secretary of the Interior in the interest of conservation.

Subpart 3404 Bonds

Sec:

3404.1 Bonding requirements.

3404.2 Type of bond required.

3404.3 Qualified sureties.

3404.4 Default.

3404.5 Release of bond.

Subpart 3404 - Bonds

§ 3404.1 Bonding requirements.

Some form of bond shall be required to be furnished before a lease or license may be issued.

(a) Corporate surety bonds, or cash may be furnished for a lease.

(b) Personal lease bonds secured by negotiable U.S. bonds of a par value equal to the amount of the required surety bond, together with a power of attorney executed on a form approved by the Director, may be furnished.

§ 3404.2 Type of bond.

(a) A compliance bond, conditioned upon compliance with all provisions of the lease except reclamation, shall be furnished in the amount determined by the authorized officer. The amount of the bond may be changed if the authorized officer considers such a change to be proper and necessary.

(b) The applicant shall file the bond in the proper office within 30 days of receiving notice. An original bond shall be furnished on a form approved by the Director.

(c) The period of liability for the compliance bond shall not be terminated until the lease account is in good standing.

(d) A reclamation bond may be required in accordance with 30 CFR 742.

§ 3404.3 Qualified sureties.

A list of companies holding certificates of authority from the Secretary of the Treasury under the Act of July 30, 1947 (6 U.S.C. 6-13) as acceptable sureties on Federal bonds is published annually in the FEDERAL REGISTER.

§ 3404.4 Default.

(a) When the surety makes payment to the Government of any indebtedness due under a lease, the face amount of the surety bond and the surety's liability thereunder shall be reduced by the amount of such payment.

(b) Thereafter, upon penalty of cancellation of all of the leases covered by such bond, that principal shall post a new bond in an amount and within such period as the authorized officer of the Bureau of Land Management may fix.

(c) In lieu of renewing the surety bond, the principal may, within the time fixed by the authorized officer, file separate bonds for each lease.

(d) These provisions may apply to any bond in force at the time of the approval of the amendment of this paragraph by filing a written consent to that effect in the proper office, and an agreement to be bound by these provisions, executed by the principal and the surety. Upon receipt, the bond will be subject to the provisions of this paragraph.

Subpart 3405 Lease Terms

Sec:

3405.1 Duration of leases.

3405.2 Dating of leases.

3405.3 Consolidation of leases.

3405.4 Land description.

3405.5 Diligent development and continued operation.

3405.6 Logical mining unit (LMU).

Subpart 3405 - Lease Terms.

§ 3405.1 Duration of Leases.

Leases shall be issued for a period of 20 years and so long thereafter as the condition of continued operation is met.

§ 3405.2 Dating of Leases.

(a) Leases will be dated the first day of the month following the date signed by the lessor. However, upon receipt of a prior written request, the authorized officer may date a lease to be effective on the first day of the month in which it is signed.

(b) Future interest leases shall become effective on the date of vesting of title to the minerals in the United States as stated in the lease.

§ 3405.3 Consolidation of leases and permits.

(a) After discovery of coal, prospecting permits may be consolidated into preference right leases if, after consultation with the Mining Supervisor, it is determined that the consolidation is justified and that it protects the interests of the United States.

(b) Competitive leases may be consolidated if, after consultation with the Mining Supervisor, it is determined that the consolidation is justified and that it protects the interests of the United States.

(c) Consolidated leases shall be identified by the oldest serial number.

§ 3405.4 Land description.

(a) Compliance with 3401.3 is required.

§ 3405.5 Diligent development and continued operation.

(a) Section 7 of the Mineral Leasing Act (30 U.S.C. 207) provides that each coal lease shall require (1) diligent development, and (2) either continued operation or in lieu thereof, when the Secretary determines that the public interest will be served, payment of an advance royalty. The Secretary has determined that the public interest will be served by authorizing the Mining Supervisor to permit payment of an advance royalty in lieu of continued operation for any particular year. Provisions for advanced royalties are described in § 3403.3-2(b)(1) of this chapter.

(b) Each coal lease shall be subject to the requirements of diligent development and continued operation and shall remain subject to the requirement of continued operation except when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee.

(c) In the case of coal leases issued before August 4, 1976, the 10-year period within which diligent development must have been achieved may be increased as follows:

(1) Upon application of the lessee, the 10-year period shall be extended by an amount of time equal to the period during which diligent development is, in the opinion of the Secretary, significantly impaired by (i) a strike, the elements, or casualties not attributable to the lessee, (ii) an administrative delay in the Department which is not caused by the lessee's action, or (iii) extraordinary circumstances not attributable to the lessee and not foreseeable by a reasonably prudent operator. In determining whether any of the conditions listed in subdivisions (i), (ii), and (iii) of this subdivision occurred and whether one or more of those conditions did, in fact, significantly impair diligent development, the Secretary's finding shall be final. The Secretary shall, however, not find to be an extraordinary circumstance under (iii) any condition arising out of normally foreseeable business risks such as: fluctuations in prices, sales, or costs, including foreseeable costs of compliance with requirements for environmental protection; commonly experienced delays in delivery of supplies or equipment; or inability to obtain sufficient sales.

(2) Upon application of the lessee, the Secretary may grant one extension, not exceeding five years, of the 10-year period because of (i) time needed to complete development of advanced technology, e.g., in situ, gasification or liquefaction processes; (ii) the large magnitude of the project (ordinarily large magnitude means a mine in which the production in the first year after the end of the extended period for diligent development is expected to be at least two million tons

if an underground mining operation or five million tons if a surface mining operation); or (iii) a contract or its equivalent which is a firm commitment for the sale or use of the first one-fortieth of the LMU reserves after the 10-year period. Irrespective of the reason for granting an extension, the lessee must produce the first one-fortieth of the LMU reserves before the end of the extension.

(d) At the time when the Secretary grants an extension under paragraphs (b) and (c) of this section, the lessee shall be notified of the revised date by which coal must be produced in commercial quantities.

§ 3405.6 Logical mining unit.

(a) Every Federal coal lease will automatically be considered to constitute an LMU as of the effective date of the lease or June 1, 1976, whichever is later. The lease may, at a later date, be included in an LMU with other Federal coal leases or with interests in non-Federal coal deposits, or both. An LMU containing any interest other than a single Federal lease will become effective only at the direction of the Mining Supervisor or upon its approval by the Mining Supervisor when requested by the lessee; the Mining Supervisor shall not direct or approve the establishment of such an LMU unless it is determined that the maximum economic recovery of all Federal deposits in the LMU will be served. The boundaries of an LMU may later be changed either upon application by the lessee and with the approval of the Mining Supervisor after consultation with the authorized officer, or by direction of the Mining Supervisor after consultation with the authorized officer.

(b) When a Federal coal lease is included in an LMU with other Federal coal leases or with interests in non-Federal coal deposits, the terms and conditions of the lease will be amended so that they are not inconsistent with the requirements imposed on that LMU of which it has become a part. In particular, diligent development, continued operation, and production in commercial quantities anywhere within the LMU, with respect to either Federal or non-Federal coal deposits, shall be considered to have occurred on each Federal lease in the LMU. The rental and royalty payments on all Federal leases in an LMU shall be combined, and advance royalties paid on any Federal lease in that LMU may, at the request of the operator of the LMU, be credited against those combined royalties.

(c) The lessee may, upon approval of the authorized officer, surrender the rights to any deposits. If these rights are not surrendered, the LMU reserves shall be adjusted. When the Mining Supervisor is determining the LMU reserves, the lessee shall be consulted about any deposits subject to the lease which the lessee does not intend to mine. The lessee shall also be consulted about the rights the lessee is prepared to surrender to decrease the LMU reserves upon which the requirements of diligent development, continued operation, and production in commercial quantities will be based.

# PART 3410 - EXPLORATION LICENSES

## Subpart 3410 - Exploration Licenses

Sec.


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AUTHORITY: 30 U.S.C. 181 et seq.

Subpart 3410 - Coal Exploration Licenses

§ 3410.0-1 Purpose.

This subpart provides for the issuance of licenses for exploring federally-owned coal deposits subject to disposal under Group 3400 regardless of surface ownership.

§ 3410.0-2 Objective.

The objective of this subpart is to allow private parties to explore jointly federally-owned coal deposits to obtain geological, environmental, and other pertinent data concerning the deposits and the lands in which they lie.

§ 3410.0-3 Authority.

These regulations are issued under the authority of section 2(b) of the Mineral Leasing Act of 1920, as amended by section 4 of the Federal Coal Leasing Amendments Act of 1975 (30 U.S.C. 201(b)).

§ 3410.0-4 Responsibilities.

(a) The Bureau of Land Management (BLM) exercises, the Secretary's discretionary authority to determine whether exploration licenses are to be issued. The Bureau is also responsible for issuing and cancelling exploration licenses and terminating the period of liability of bonds. The regulations in this subpart shall be administered by the Director

through the State Director and the authorized officer, subject to the supervisory authority of the Secretary. The Bureau of Land Management State Office having jurisdiction over the lands involved is also the office of record. (See subpart 1821).

(b) The Geological Survey exercises the Secretary's authority regarding operations conducted within the area of operations by the licensee. It is also responsible for all geological, economic, and engineering determinations for the Department's coal leasing program.

(c) The authorized officer, in consultation with the Geological Survey, and where appropriate, the surface management agency and the surface owner if other than the United States, formulates the requirements to be incorporated in exploration licenses for the protection of the surface resources and for reclamation. In developing guidelines and bonding requirements, the authorized officer shall use the surface operating and reclamation performance standards in 30 CFR Part 211.

(d) The Geological Survey, after consultation with the authorized officer, and where appropriate, the surface management agency and the surface owner if other than the United States, reviews and concurs in exploration plans and recommends termination of the period of liability under the bond upon the completion of exploration operations.

§ 3410.0-5 Definitions.

As used in this subpart:

(a) "Coal deposits" means all federally-owned deposits subject to disposal under applicable law, except those held in trust for Indians.

(b) "Exploration" means drilling, excavating, and geophysical or geochemical surveying operations designed to obtain detailed data on the physical and chemical characteristics of coal deposits and their environment including the strata above the deposit, the hydrologic conditions associated with the deposit, and any other information that may be necessary to prepare a complete resource evaluation of the land.

(c) "Surface management agency" means the Federal agency or its authorized officer with jurisdiction over the surface of lands containing coal deposits subject to this part.

(d) "Exploration plan" means a detailed plan showing the location and type of exploration work to be conducted, environmental protection procedures, present and proposed roads and reclamation and abandonment procedures to be followed upon completion of such operations.

(e) "Exploration license" means a license issued by the authorized officer to permit the exploration of federally-owned coal deposits under terms and conditions that will protect the surface and subsurface resources and the environment, and provide for the reclamation of any damage caused by such exploration.

(f) "Participate" means to have or take part or share with others in an exploration license.

(g) "Participant" means a person who participates or shares in an exploration license.

(h) "Reasonable amount of coal for analysis and study" means only that amount of coal necessary to establish whether or not a federally-owned deposit can be economically extracted and that can be removed without causing substantial disturbance to the natural land surface.

(i) "Substantial disturbance to the natural land surface" means any disturbance other than that necessary for locating potential coal deposits and for obtaining the access to those deposits necessary to determine their location and quality. This may be done by such operations as surface sampling or drilling geologic study and exploration holes. These operations shall extend only to the degree and extent necessary to determine the nature of the overlying strata and the depth, thickness, shape, grade, and quality of the coal deposit.

§ 3410.1 Lands subject to exploration license.

(a) Exploration licenses may be issued for:

(1) Lands administered by the Secretary that are subject to coal leasing;

(2) National forest lands or other lands administered by the Secretary of Agriculture through the Forest Service that are subject to coal leasing;

(3) Coal deposits in lands which have been conveyed by the United States subject to a reservation to the United States of mineral deposits, to the extent that those deposits are subject to lease under regulations in Group 3400; and

(4) Coal or lignite deposits in acquired lands set apart for military or naval purposes.

(b) No exploration license shall be issued for land on which a coal lease has been issued.

§ 3410.2 Prelicensing procedures.

§ 3410.2-1 Environmental review.

Before an exploration license shall be issued:

(a) The authorized officer shall, using applicable procedures in section 3430.4-5 and using the exploration plan submitted by the applicant, make an environmental assessment and technical examination of the potential effect of such exploration on the resources of the area and its environment. These resources include surface and ground water; fish and other aquatic resources; wildlife habitats and populations; visual resources; and recreation, cultural, and other resources in the affected area. Exploration shall not begin until an environmental assessment is accomplished and the exploration plan has been approved.

(b) If the authorized officer determines that an environmental statement is required by the National Environmental Policy Act of 1969 (43 U.S.C. 4332), a statement shall be prepared.

§ 3410.2-2 Cultural resources

If lands in the National Register or nominated for inclusion in the National Register contain cultural resources which might be affected by the issuance of an exploration license, no license for such lands shall be authorized until after compliance with section 106 of the Historic Preservation Act (16 U.S.C. 470f).

§ 3410.2-3 Threatened or endangered species.

The authorized officer shall not issue an exploration license if it is determined that any threatened or endangered species of fauna or flora will be jeopardized or that critical habitat would be destroyed or adversely modified by the exploration activities authorized in that license. In making this determination, the authorized officer shall consult the surface management agency, if the surface is not managed by BLM, and if appropriate, the Fish and Wildlife Service.

§ 3410.2-4 Surface management agency.

The authorized officer may issue an exploration license covering lands the surface of which is under the jurisdiction of any Federal agency other than the Bureau of Land Management only in accordance with those conditions prescribed by the surface management agency concerning the use and protection of the nonmineral interests in those lands.

§ 3410.3 Licenses.

§ 3410.3-1 Applications for license.

(a) Exploration license applications shall be submitted to the authorized officer and shall be subject to the following requirements:

(1) No specified form of application is required.

(2) The tract or tracts to be explored shall be described by legal description or, if on unsurveyed lands, by metes and bounds.

(3) Each application shall contain three copies of an exploration plan which complies with the requirements of 30 CFR 211.10.

(4) Each application and its supporting documents shall be filed in the proper BLM Office with a nonrefundable $250 filing fee.

(5) Exploration license applications shall be for no more than 25,000 acres in a reasonably compact area and entirely within one State.

(b) Any person qualified to hold leases or contracts issued pursuant to subpart 3402 may apply for an exploration license.

(c) Nothing in this subpart shall preclude the authorized officer from issuing a call for an expression of interest in exploration licenses for a given area.

(d) Applicants for licenses shall be required, and prior to license issuance, to provide an opportunity for other parties to participate in the approved exploration plan on a pro rata cost sharing basis. Upon notice that a license will be issued, an applicant shall publish a "Notice of Invitation," approved by the authorized officer, once every week for four consecutive weeks in the BUSINESS AND COMMERCIAL DAILY and in at least one newspaper of general circulation in the area where the lands covered by the license application are situated. This notice shall contain an invitation to the public to participate in the exploration program. Copies of published Notices of Invitation shall be filed with the authorized officer for posting in the proper BLM Office. Any person who elects to participate in the exploration program shall notify the authorized officer and the applicant in writing within 2 weeks after the final publication. The authorized officer may require modification of the original exploration plan to accommodate the needs of additional participants. When the applicant has complied with the requirements of this section, all else being regular, the authorized officer may issue the exploration license.

(e) An application to conduct exploration which could have been conducted as a part of the exploration under an existing license may be rejected.

§ 3410.3-2 Issuance and termination of license.

(a) No person may explore without a lease unless an exploration license has been issued. An exploration license shall not be required for "casual use" as defined in 20 CFR 211.10(a). The authorized officer has discretionary power in issuing exploration licenses under this Subpart. An exploration license shall confer no right to a lease.

(b) Exploration licenses may be issued for not more than two years, including time for clean up and restoration.

(c) Subject to the continued obligation of the licensee and the Surety Company to comply with the terms and conditions and special stipulations of the license, the plan, and the regulations, a licensee may relinquish an exploration license for all or any portion of the lands included under the license. A relinquishment shall be filed in the proper BLM Office.

(d) An exploration license may be revoked for non-compliance with the terms of the license, the plan, or the regulations. Revocation shall take place after the licensee has been notified of the violations and has failed to correct the violations within the period prescribed in the notice.

(e) The approved exploration plan shall be dated, attached, and made a part of each license issued.

(f) When unforeseen conditions that could result in significant disturbance or damage are encountered, or when geologic or other physical conditions warrant a modification in the approved exploration plan, (1) the authorized officer, after consultation with the Mining Supervisor and, where appropriate, the surface management agency, may adjust the terms and conditions of the license or, (2) the Mining Supervisor, after consultation with the authorized officer, and where appropriate, the surface management agency, may approve changes in the exploration plan.

(g) Exploration licenses may not be extended. Exploration operations may not be conducted after a license has expired. The licensee may apply for a new license as described in 3410.3-1. A new license may be issued simultaneously with the termination of the existing license.

§ 3410.3-3 Rights under licenses.

(a) The issuance of an exploration license shall confer the right to perform exploration operations in accordance with the specific terms and conditions of the license, the approved plan, and the regulations.

(b) The issuance of exploration licenses shall not preclude the issuance of coal leases under applicable regulations. If a coal lease is issued for lands embraced in an exploration license, those lands shall be eliminated from the license upon the effective date of the lease.

(c) A licensee may not remove for sale any coal from the deposits subject to his license, but a reasonable amount of coal may be removed for analysis and study.

§ 3410.3-4 Operating regulations.

The licensee shall comply with all regulations of the Secretary of the Interior including the provisions of the operating regulations of the Geological Survey (30 CFR Part 211 and the Office of Surface Mining (30 CFR Subchapter D). Copies of the operating regulations may be obtained from the Mining Supervisor. Authorized representatives of the Secretary and, where appropriate, any surface management agency, shall be permitted to inspect the premises and operations. The licensee shall provide for the free ingress and egress of Government officers and other persons using the lands under authority of the United States.

§ 3410.3-5 Surface protection and reclamation.

(a) The authorized officer shall include in each exploration license requirements and stipulations to protect the environment and other resources and to ensure reclamation of the land disturbed by exploration.

(b) A licensee may not substantially disturb the natural land surface.

§ 3410.3-6 Ground water data.

The applicant may be required to collect and report ground water data to the authorized officer.

§ 3410.3-7 Bonds.

(a) Bonding provisions in Subpart 3403 of this Part apply to these regulations.

(b) Prior to issuing an exploration license, the authorized officer, after consultation with the Mining Supervisor and, where appropriate, the surface management agency and the surface owner, shall insure that the amount of the bond or bonds to be furnished is sufficient to insure compliance with the terms and conditions of the license and regulations.

In no event shall the amount of such bond be less than $5,000.

(c) Upon completion of an exploration and reclamation program that is in compliance with the terms and conditions of the exploration license, the approved plan, and the regulations, or upon discontinuance of exploration operations and completion of such reclamation as may be needed to the satisfaction of the authorized officer and, where appropriate, the surface management agency, the authorized officer shall terminate the period of liability of the compliance bond. Where the surface of the land being explored is privately owned, the authorized officer shall not terminate the period of liability under the compliance bond until the surface owner has notified the authorized officer, in writing, that the surface has been reclaimed in a satisfactory manner. Should the licensee and surface owners be unable to agree on the adequacy of the reclamation, the authorized officer shall make the final determination. The

period of liability under the compliance bond shall be terminated after it is determined that the terms and conditions and special stipulations of the license, the approved plan, and the regulations have been met.

§ 3410.4 Use of data.

The licensee shall furnish to the Mining Supervisor copies of all data (including but not limited to, geological, geophysical, and core drilling analyses) obtained during exploration. The licensee shall submit such data and, where appropriate, the methods by which the data were gathered, at such time and in such form as required by the Mining Supervisor, the authorized officer, or surface management agency, or as specified in this Subpart, the license, or the plan. All data shall be considered confidential until the areas involved have been leased or until the Mining Supervisor determines that public access to the data would not damage the competitive position of the licensee, whichever comes first.

§ 3410.5 Use of surface.

(a) A licensee shall be entitled to use for exploration purposes only that surface area of the licensed lands that is authorized in the approved exploration plan.

(b) Operations under these regulations shall not unreasonably interfere with or endanger operations authorized under any other Act or regulation.

(c) The licensee shall comply with all applicable Federal, State and local laws and regulations, including the regulations in Parts 3440, 3400, and 3600 of this chapter, and 30 CFR Parts 311 and 231.

(d) Any person who willfully conducts coal exploration on lands subject to this subpart without an exploration license shall be subject to the provisions of § 9239.5-3(f) of this chapter.

PART 3420 - NONCOMPETITIVE LEASES - COAL

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AUTHORITY 30 U.S.C. 181 et seq.; 30 U.S.C. 201-203; 30 U.S.C. 351-358; 30 U.S.C. 1201 et seq.; and 43 U.S.C. 1740.

Part 3420 NONCOMPETITIVE LEASES - COAL

Subpart 3420 Preference Right Leases

§ 3420.0-1 Purpose.

These regulations set forth procedures for filing and processing preference right coal lease applications on Federal coal lands and deposits.

§ 3420.0-3 Authority.

These regulations are issued under the authority of the Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.) and the Mineral Leasing Act for acquired Lands of 1947, as amended (30 U.S.C. 351-358).

§ 3420.0-7 Scope.

All lease applications have already been filed by applicants who may be entitled to a noncompetitive lease under the terms of prospecting permits. No additional prospecting permits that confer a preference right to a coal lease will be issued. Therefore, these regulations address only the processing procedures for pending preference right lease applications.

§ 3420.1 Preference right leases.

An applicant for a noncompetitive coal lease derived from a prospecting permit for coal shall be entitled to a noncompetitive coal lease if the applicant can demonstrate that commercial quantities of coal were discovered within the term of the permit.

§ 3420.1-1 Commercial quantities - Standards.

(a) The deposit discovered under the permit shall be of such character and quantity that a prudent person would be justified in further expenditure of labor and means with a reasonable prospect of success in developing a valuable mine.

(b) The applicant shall present sufficient evidence to show that there is a reasonable expectation that revenues from the sale of the coal will exceed the cost of developing the mine and extracting, removing, transporting, and marketing the coal. The costs of development shall include the estimated cost of exercising environmental protection measures and rehabilitating disturbed lands.

(c) Standards in paragraphs (a) and (b) shall apply to all applications for perference right coal leases by prospecting permittees.

§ 3420.1-2 Lease area and acreage limitation.

(a) The issuance of a preference right lease shall not increase the applicant's total leased acreage of Federal coal lands beyond that provided for in 43 CFR 3402.1-2.

(b) The lease area shall include those lands that form a reasonably manageable unit.

§ 3420.1-3 Duration of leases.

Issued or readjusted coal leases shall be for a term of 20 years and for as long thereafter as the lessee is producing coal in commercial quantities from the lease as provided in 43 CFR 3405.

§ 3420.1-4 Dating of leases.

Leases will normally be dated the first day of the month following the date signed by the lessor. Upon receipt of a prior written request, the lease may be dated the first day of the month in which it is signed.

§ 3420.1-5 Logical mining unit.

Any Federal coal lease shall either be considered a logical mining unit or be included in a logical mining unit that includes other Federal coal leases or interests in non-Federal coal or both as provided in 43 CFR 3405.

§ 3420.2 Application - Required information.

All preference right coal lease applications shall contain the following information.

(a) The measured and indicated quantity of reserves as defined by U.S. Geological Survey bulletin 1450B and the quality of the coal reserves shall be included.

(1) Quantity shall be indicated by structural maps of the tops of all beds to be mined, isopachous maps of beds to be mined and interburden; and, for beds to be mined by surface mining methods, isopachous maps of the overburden. These maps shall show the location of test holes and outcrops. An estimate of the measured and indicated reserves for each bed to be mined shall be included.

(2) Coal quality data shall include, at a minimum, an average proximate analysis and BTU content for coal beds. Also, all supporting geological and geophysical data used to develop the required information shall be submitted.

(b) Topographic maps as available from State or Federal sources showing physical features, drainage patterns, roads and vehicle trails, utility systems, and water sources shall be included. The location of proposed development and mining operations facilities shall be superimposed on the maps. These maps shall include the approximate locations and extent of tailings and overburden areas; location and size of pit areas; and the location of water sources or other resources that may be used in the proposed operation and facilities incidental to that use.

(c) Certified abstracts indicating the presence of any mining claims located prior to the issuance of the prospecting permit that lie within or partly within the preference right lease application area shall be included.

(d) A narrative statement shall be submitted including:

(1) The anticipated scope of operations, the schedule of operations, and the types of equipment to be used;

(2) The mining method to be used and an estimate of the expected mining sequence and production rate;

(3) The relationship, if any, between operations planned on the land applied for and existing or planned operations and facilities on adjacent lands;

§ 3420.3 Planning and environment.

A lease may not be issued for Federal coal deposits unless the lands involved have been included in an acceptable land use plan or land use analysis in accordance with Part 1600 of this Title, and unless coal leasing is compatible with that plan. Such planning or analysis process shall include an unsuitability determination in accordance with 43 CFR 3431.

§ 3420.3-1 Technical examination/environmental assessment.

In accordance with 43 CFR 3430.4-3, the authorized officer shall undertake a technical examination and environmental assessment of the proposed lease area.

§ 3420.4 Final showing.

(a) Upon completion of the technical examination/environmental assessment, the authorized officer will request a final showing by the applicant.

(b) The authorized officer will transmit, with the request for a final showing, the following:

(1) The proposed lease form;

(2) Any proposed stipulations that are considered necessary to (i) prevent irreparable damage or destruction of unique environmental values that are identified through the unsuitability criteria in subpart 3441; and

(4) A brief description, including maps or aerial photographs as appropriate, of (i) existing land uses on and adjacent to the land applied for; (ii) known geologic, visual, cultural, or archaeological features; and (iii) known wildlife habitat, particularly threatened or endangered species, that may be affected by the planned exploration and mining operations on the land applied for;

(5) A brief description of measures planned to prevent or control fire, soil erosion, ground and surface water pollution, damage to wildlife or their habitat, air and noise pollution, and hazards to public health and safety; and

(e) A brief description of any plans that the applicant wishes to have considered by the authorized officer, which show how the applicant plans to reclaim disturbed sites and otherwise meet applicable laws and these regulations.

§ 3420.2-1 Additional information.

(a) If the applicant has not submitted all information required in section 3420.2, the authorized officer shall forward a request for additional information specifying the information required.

(b) The applicant shall submit any requested additional information within 60 days of the receipt of the request. The authorized officer may grant one 60-day extension if a written request is received within the first 60-day period.

(3) A copy of the technical examination/environmental assessment.

(c) Within 60 days of receiving the proposed lease form, the applicant shall submit the following information:

(1) Estimated revenues;

(2) The estimated costs that a prudent person would consider before deciding to operate a mine, including but not limited to the cost of developing the mine, removing the coal, processing the coal to make it saleable, transporting the coal, applicable royalties and taxes, and complying with applicable laws and regulations, the proposed lease terms, and special stipulations;

(3) A comparison of the estimated costs and revenues; and

(4) The estimated cost and revenues of the combined mining venture, if the lease is to become a part of a logical mining unit containing adjacent lands.

(c) The information submitted by the applicant shall be sufficiently detailed to determine whether the applicant's showing (1) has a reasonable factual basis, (2) supports the applicant's assertion that the proposed lease contains commercial quantities of coal, and (3) reflects a consideration of all factors required by this section.

§ 3420.4-1 Additional information.

(a) If the applicant has not submitted all information required in section 3420.4, the authorized officer shall forward a request for additional information specifying the information required.

(b) The applicant shall submit any requested additional information within 60 days of the receipt of the request. The authorized officer may grant one 60-day extension if a written request is received within the first 60-day period.

§ 3420.5 Basis for denial of application.

The authorized officer shall reject the application if:

(a) The applicant does not respond to a request for additional information within the time period specified in section 3420.4-1;

(b) The final showing of the applicant fails to show that coal exists in commercial quantities on the lands applied for; or

(c) The land applied for is unsuitable for surface coal mining and the applicant's proposed mining method is by surface techniques.

§ 3420.5-1 Coal lease exchange.

If the proposed lease has been shown to contain commercial quantities of coal, but the application is rejected because of environmental or habitat factors, or because the Secretary has determined that coal leasing would not be in the best interest of the public, the applicant may enter into the coal lease exchange procedures provided under 43 CFR 3425 or 3426 to secure bidding rights or modifications to an existing coal lease or an alternative coal or other mineral lease.

§ 3420.5-2 Appeals, Lack of showing.

(a) If the application is rejected because the existing commercial quantities of coal cannot be adequately shown, the applicant may, in accordance with the procedures in 43 CFR 4, file a notice of appeal and statement of reasons for the appeal.

(b) The applicant shall have the right to a hearing before an Administrative Law Judge if the applicant alleges that the application sufficiently shows entitlement to a lease.

(c) In such a hearing, the applicant shall bear both the burden of going forward and the burden of proof, to show, by a preponderance of evidence, that commercial quantities of coal exist in the proposed lease area.

§ 3420.6 Approval of lease.

The lease shall be issued if, upon review of the application, the land use plan or analysis, and the technical examination/environmental assessment record, the authorized officer determines that the commercial quantities standard has been satisfied and that:

(a) Environmental damage can be avoided or acceptably mitigated and the damaged land reclaimed:

(b) No endangered species habitat will be destroyed;

(c) The applicant has used reasonably economic assumptions and data to support the showing that coal has been found on the proposed lease in commercial quantities; and

(d) The applicant has considered all factors required by this Subpart.

§ 3420.6-1 Diligent development and continuous operation.

Each Federal coal lease shall be subject to the requirements of diligent development and continuous operation defined in 43 CFR 3400.0-5(f)(g), except when operations under the lease are interrupted by strikes, natural elements, or casualties not attributable to the lessee as provided in 43 CFR 3405.

§ 3420.6-2 Bonding.

Bonding shall be set in accordance with 43 CFR 3404.

§ 3420.6-3 Lease terms (Reserved).

§ 3420.7 Trespass.

Mining operations conducted prior to the effective date of a lease shall constitute an act of trespass.

Subpart 3425 - Coal Lease Exchange

§ 3425.0-2 Objective.

The objective of these regulations is to provide alternatives for Federal coal development where Federal coal is needed to satisfy the Nation's energy demands and other public values must be preserved.

§ 3425.0-3 Authority.

These regulations are issued under the authority of:

(a) Sections 2 and 3 of the Mineral Leasing Act of 1920, as amended (30 U.S.C. 201 and 203);

(b) The Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et. seq.); and

(c) Section 310 of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1740).

§ 3425.0-5 Definitions.

In this subpart:

(a) "Certificate of bidding rights" means a right to apply the fair market value of a relinquished Federal coal lease or preference right as a credit against the bonus bid on a competitive coal lease acquired at any subsequent Federal coal lease sale.

(b) "Grant of modifications" means the Secretary's approval of including additional coal lands or deposits in an existing coal lease or leases if these lands or deposits are contiguous to the modified lease and if the additions do not exceed 160 acres per lease or add acreage exceeding that of each original lease.

§ 3425.1 Lands unsuitable for coal development.

A coal lease exchange may be appropriate where Federal coal resources may not be developed because the Secretary determines that coal exploration and mining operations would not be in the public interest.

§ 3425.2 Qualified exchange proponents - Limitations.

Any person who holds a Federal coal lease or a preference right that has met the commercial quantities requirements of section 3420.1-1 to a Federal coal lease on lands described in section 3425.1, is qualified to propose an exchange.

The exchange may involve the issuance of a lease for any leasable mineral other than coal, bidding rights in any subsequent coal lease sale, or Federal coal lease modifications. These adjustments may be made to the extent of the Secretary's authority in exchange for the relinquishment of that part of the Federal coal lease or prospecting permit area that has been determined unsuitable for development because of nonmineral public values identified or discovered after the lease or permit was issued.

§ 3425.3 Exchange procedures.

§ 3425.3-1 Exchange notice.

(a) The Secretary may initiate exchange procedures by notifying in writing a Federal coal lessee or preference right coal lease applicant that an exchange of mineral leases or other values is considered appropriate.

(b) The exchange notice shall include a statement of why the Secretary believes an exchange is appropriate.

(c) The notice may contain a description of the lands on which the Secretary would offer exchange terms. The description may include all or part of a lease or preference right application area or more than one.

(d) The notice shall contain a request for a reply from the preference right lease applicant or Federal coal lessee, indicating a willingness to negotiate an exchange.

§425.3-2 Reply by proponent.

The preference right lease applicant or Federal coal lessee wishing to negotiate an exchange shall reply in writing within 60 days of the receipt of the exchange notice. The reply may include a description of the lands on which the proponent would accept an exchange lease or grant of coal lease modifications.

§ 3425.3-3 Agreement to terms.

(a) The authorized officer and the proponent shall:

(1) Negotiate for the selection of appropriate exchange lands containing leasable minerals other than coal; or

(2) Negotiate appropriate coal lease modification; and/or

(3) Establish the value of coal lease bidding rights to be granted in exchange for the relinquishment of the coal lease or preference right.

(b) Any land leased in exchange shall to the satisfaction of the proponent and the Secretary, be a lease tract containing commercial quantities of coal or deposits of other leasable minerals of comparable value to that relinquished. A lease tract is considered comparable for exchange when the Secretary concludes that the leasehold value of the more valuable tract is less than ten percent greater than that of the less valuable tract.

(c) Land proposed for lease in exchange or for inclusion in an existing coal lease shall be subject to leasing under 43 CFR 3401 or 3500, as appropriate.

§ 3425.3-4 Determination of value.

The value of the land to be leased in exchange and the bidding right shall be equal to the fair market value of the leasehold to be relinquished. A reply to the exchange notice by a preference right

coal lease applicant or lessee indicating willingness to enter into an exchange shall also indicate willingness to provide the geologic and economic data needed by the Secretary to determine the fair market value of the leasehold to be relinquished.

§ 3425.3-5 Notice and public hearing.

After the proponent and the Secretary agree on the land to be leased, coal lease modifications to be granted, or coal bidding rights to be granted, notice of the proposed exchange shall be published in the FEDERAL REGISTER and in a newspaper of general circulation in the counties where both the offered and selected mineral lands are located. The notice shall announce that upon request at least one public hearing will be held in a city located near the tracts involved. The notice shall also contain the Secretary's preliminary finding that the proposed exchange is in the public interest. The hearing shall be held to get public comments on the merits of the proposed exchange.

§ 3425.4 Issuance of lease or grant of other values.

§ 3425.4-1 Issuance of lease.

(a) If after public hearing, the Secretary by written decision, concludes that the issuance of an exchange non-coal mineral lease or coal lease modification is in the public interest, lease stipulations for operations on the exchange lease or modified lease shall be established.

(b) The exchange lease shall contain:

(1) A statement that the lessee thereby quitclaims any right or interest in the lease or preference right lease application exchanged; and

(2) A statement of the Secretary's finding that the issuance is in the public interest.

(c) The exchange non-coal mineral lease or modified coal lease shall be subject to all relevant provisions of 43 CFR 3400 or 3500 as appropriate and 30 CFR 211 and Subchapter D.

§ 3425.4-2 Grant of bidding rights.

(a) If the Secretary by written decision, concludes that a grant of bidding rights is in the public interest, a certificate of bidding rights for the value of the relinquished leasehold shall be issued to the proponent.

(b) The certificate of bidding rights may only be used as a credit against the balance due on successful bonus bids in subsequent competitive coal lease sales within the same State as the relinquished coal lease or preference right.

(c) The certificate of bidding rights shall be useable in any subsequent competitive coal lease sale when its holder is the successful bidder.

Subpart 3426 - Coal Lease Exchange - Alluvial Valley Floors

§ 3426.0-1 Purpose.

The purpose of this subpart is to establish procedures for fee coal lease exchanges where coal development operations would interrupt, discontinue, or preclude farming on alluvial valley floors west of the 100th Meridian, west longitude.

§ 3426.0-3 Authority.

These regulations are issued under the authority of section 510 of the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1260).

§ 3426.0-5 Definitions.

In this subpart:

(a) "Alluvial valley floors" means unconsolidated stream-laid deposits in streams where there is enough water for subirrigation or for flood irrigation agricultural activities, excluding upland areas generally covered by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation, and windblown deposits.

(b) "Substantial legal and financial commitments" means major investments of money in power plants, railroads, coal-handling and storage facilities, land, other capital intensive improvements, and

fixed equipment made on the basis of long-term, legally enforceable coal sales contracts which cannot be cancelled except upon payment of a substantial penalty. Investments are "major" if they are substantial both in relationship to the aggregate assets of the proposed operator and the operator's beneficial owners, other than noncontrolling shareholders in publicly-held corporations, and in relationship to the aggregate capital expenditures which reasonably can be anticipated to be made for capital improvements and fixed equipment at the mine site to and including completion of all reclamation operations. Costs of the acquisition of the coal in place or of the right to mine it do not constitute "substantial legal and financial commitments."

§ 3426.1 Qualified exchange proponent.

Any person who holds a Federal coal lease west of the 100th Meridian, west longitude, and who has made substantial legal and financial commitments, as defined in 30 CFR 762.5(e) prior to January 1, 1977, in connection with the lease and otherwise meets the criteria of section 501(b)(5) proviso (30 U.S.C. 1260(b)(5)) may be qualified to propose and exchange under this subpart.

§ 3426.1-1 Limitations.

The lease area selected by the proponent must be acceptable for mining operations under criteria of both the Bureau of Land Management and the Federal or State Regulatory Authority.

§ 3426.2 Initiation of exchange.

The lessee who has been refused an operations permit may propose the exchange to the Secretary.

§ 3426.1-2 Exchange procedures.

The exchange shall be processed in accordance with the procedures in 43 CFR 3425 for fee coal exchanges.

§ 3426.3 Financial burden.

The exchange proponent shall bear all administrative costs of the exchange, including the cost of establishing the value of the exchange leases.

§ 3426.4 Lease issuance.

Any coal lease issued as a result of an exchange under this subpart shall be subject to all relevant provisions of 43 CFR 3400, 30 CFR 211, and 30 CFR Subchapter D.

# PART 3430 - COMPETITIVE LEASING

Subpart 3430 - Competitive leasing.

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## Subpart 3430 - Competitive Leasing

§ 3430.0-1 Purpose.

This subpart sets forth the procedures for the competitive leasing of Federal coal.

§ 3430.0-2 Objectives.

The objectives of these regulations are (a) to develop federally owned coal through a leasing system involving land use planning and environmental assessment processes; (b) to ensure that an adequate supply of Federal coal is developed efficiently with minimal adverse effects on society and the environment; (c) to ensure that Federal coal is leased at its fair market (economic) value; and (d) to ensure that Federal coal is developed in consultation, cooperation, and coordination with the public, State and local governments, and involved Federal agencies.

§ 3430.0-3 Authority.

Regulations in this subpart are issued under the authority of:

(a) The statutes cited in 43 CFR 3400.0-3.

(b) The Small Business Act of 1953, as amended (15 U.S.C. 634-644).

3430.0-5 Definitions.

As used in this subsection:

(a) "Preliminary Tract" means an area containing technically recoverable coal that will feasibly support a commercial mining operation. The coal may either be owned by the Federal Government or be in a mixed ownership pattern. All Federal coal within the delineated area may be offered as a single unit in the same lease sale.

(b) "Existing Mining Operation" means that area of private, leased or licensed lands (within a logical mining unit) containing surface or underground excavation or support facilities that (1) contribute directly to coal mining, preparation and handling; (2) produce coal as a commercial venture with a historic production record and/or contractual production commitments; and (3) contain coal reserves intended for extraction in the course of the mining operation.

(c) "Known Recoverable Coal Resource Area (KRCRA)," means, an area determined by the U.S. Geological Survey, to contain federally owned coal meeting minimum standards for recoverability. These

standards are determined from past and current mining practices in the area. Boundaries for such an area show only the extent of recoverable coal based on projections made at the time of determination.

(d) "Secretary" means the Secretary of the Interior.

(e) "Bonus" means that value in excess of the rentals and royalties that accrues because of coal resource ownership.

(f) "Coal resource" means coal quantities concentrated in such forms that extraction is economically feasible.

(g) "Coal Resource Economic Value (CREV)" means the value of the recommended bonus bids, incremental royalties, rentals, advance royalties, royalties, and other fees. The Geological Survey shall supply this value to BLM prior to any coal-lease sale.

(h) "Fair market value" means the amount in cash, or on terms reasonably equivalent to cash, for which in all probability the property would be sold by a knowledgeable owner willing but not obligated to sell to a knowledgeable purchaser who desires but is not obligated to buy.

(i) "Incremental royalty" means that part or all of the bonus paid in proportion to coal production.

(j) "Maximum economic recovery (MER)" means the amount of coal that can be recovered by prudent mining practices from all seams that are collectively profitable to be mined on any tract evaluated for leasing at the time of the MER determination. Social and environmental costs shall be considered in determining profitability.

(k) "Mining method evaluation" means a written comparison of mining method alternatives used to determine maximum economic recovery.

(l) "Public bodies" means Federal and State agencies, municipalities, and rural electric cooperatives and similar organizations, and nonprofit corporations controlled by any of the such entities.

(m) "Socioeconomics" means the relationship between individuals, communities, institutions, and the factors of production.

§ 3430.0-6 Policy.

(a) Coal leases may be issued only after competitive bidding. There shall be special opportunity coal lease sales for qualified public bodies and for small businesses. The financial requirements for special opportunity coal lease sales are derived in the same way as for other coal lease sales. Before each sale, the Department shall evaluate and compare the method or methods of mining that will achieve the

maximum economic recovery of the coal resource. The Department shall receive fair market value for all coal lease sales.

(b) Surface owner protection (Reserved).

§ 3430.1 Procedures.

§ 3430.1-1 General.

The leasing program consists of four principal elements; comprehensive multiple resource land use planning; specific tract identification and selection; establishment of production targets; and lease sale. The application or criteria for unsuitability for leasing is an integral part of land use planning. All competitive lease sales, except those held under emergency leasing criteria, shall be initiated by the Secretary.

§ 3430.1-2 Lands subject to evaluation for leasing.

(a) All lands subject to coal leasing under the mineral leasing laws are subject to evaluation under this subpart. See section 3401.1.

§ 3430.1-3 Known Recoverable Coal Resource Areas.

No areas outside Known Recoverable Coal Resource Areas (KRCRA) shall be leased. Planning for coal resource development may be undertaken for areas outside of KRCRA's when available information indicates that Federal coal may exist in these areas, and that these areas should be studied for potential designation as a KRCRA.

§ 3430.1-4 Special leasing opportunities.

(a) The Secretary shall, under the procedures established in this subpart, reserve and offer a reasonable number of coal lease tracts as special leasing opportunities. Except for the limitation on bidding contained in paragraph (b) of this subpart, all requirements in this Subpart apply to special leasing opportunities, including the requirement that coal be leased at its fair market value.

(b) Special leasing opportunities shall involve two classes of bidders.

(1) Public bodies.

(i) Only public bodies, including Federal agencies, rural electric cooperatives, or nonprofit corporations controlled by any of these entities with a definite plan for producing energy for their own use or for two or more of their members or customers shall bid for leases designated as special leasing opportunities for public bodies.

(ii) Public bodies shall submit evidence of qualification as part of their expression of leasing interest.

(iii) The Secretary may designate certain coal lease tracts as special leasing opportunities for public bodies only if a public body has requested, in the planning or specific tract identification process or elsewhere, that the procedures of this section apply. Leases issued under this section to public bodies may be assigned only to public bodies.

(2) Small business.

(i) When necessary to comply with the requirements of the Small Business Administration Act, the Secretary shall designate a reasonable number of tracts for special leasing opportunities for businesses qualifying under Title 13 CFR Part 121.

(ii) Leases issued under this secion may be assigned only to small businesses.

§ 3430.2 Land use plans.

§ 3430.2-1 Preparation of a land use plan.

The Secretary may not issue a lease for coal deposits unless the lands containing coal deposits have been included in a comprehensive land use plan or land use analysis and unless the sale is compatible with the plan. Plans shall be prepared in accordance with the multiple use and sustained yield principles set forth in the Federal Land Policy and Management Act of 1976, or under the planning requirements applicable to any Federal agency with surface management authority over lands subject to leasing. All lands containing Federal coal regardless of surface ownership shall be evaluated by this process. On lands where Federal coal underlies non-Federal surface, land use decisions are made only regarding the disposition of the Federal mineral rights and not the surface. Where non-Federal surface overlying Federal mineral rights are covered in plans of State and local governments having jurisdiction over those surface lands, the recommendation of those plans shall govern Federal coal leasing recommendations affecting surface management except those decisions for which the Secretary is responsible under the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.).

§ 3430.2-2 Planning responsibilities.

(a) Land use plans for lands administered by the Bureau of Land

Management shall be prepared under the procedures set forth in 43 CFR 1600.

(b) If the Secretary finds that there is no Federal interest in the surface or that coal resources in an area are insufficient to justify the costs of a Federal comprehensive land use plan, lands in that area may be leased if the lands containing the coal deposits have been included in either a comprehensive land use plan prepared by the State within which the lands are located, or a land use analysis prepared by the Secretary of the Interior under the criteria set forth in 43 CFR 1600;

(c) The Department of Agriculture and other Federal agencies with jurisdiction over lands in which there is coal mining interest are responsible for land use plans for those lands.

3430.2-3 Coal resource information.

An acceptable land use plan shall contain an assessment of the amount of coal recoverable by either surface or underground mining operations or both. Normally this information, including coal resource occurrence and coal development potential maps, shall be obtained from the U.S. Geological Survey. When this is not the case, other data

sources such as universities, State Governments, or private entities may be used.

3430.2-4 Lands acceptable for further consideration for leasing.

The major land use planning decision relating to the coal resource shall be the delineation of areas acceptable for further consideration for leasing. The areas acceptable shall be identified by screening out areas that:

- are considered not to contain coal reserves of high to moderate development potential;

- are considered unsuitable for leasing under the provisions of Section 522 of the Surface Mining Control and Reclamation Act and the President's environmental message;

- are determined with reasonable certainty not to be reclaimable to their present level of productivity or higher;

- are considered to be of higher value for other uses through the multiple-use, resource trade-off decisions; and

- are split estate lands where the coal would be recovered by surface mining methods and the surface owner (as defined in

the Surface Mining Control and Reclamation Act) has indicated a definite preference against surface mining of the land.

The land use plans may also limit development levels or rates within the areas identified for further consideration. The screening factors listed above shall be applied only to those lands not eliminated under the previous factor.

(a) Only those areas subject to evaluation for leasing (3430.1-2) that have high or moderate development potential shall be considered for leasing. This determination shall be based on the Geological Survey's Coal Resource Occurrence/Coal Development (CRO/CDP) maps. If a CRO/CDP maps are not available, other information shall be used as discussed in Section 3430.2-3. If other data sources are used, the same criteria for designating coal reserves as high or moderate development potential shall be used as are used by the Geological Survey.

(b) In accordance with the provisions and standards of Section 522 of the Surface Mining Control and Reclamation Act of 1977, and the President's environmental message, the Secretary shall review the Federal lands to determine whether there are areas unsuitable for all or certain types of coal mining. All areas considered unsuitable for all types of mining shall be considered unsuitable for leasing. For a detailed listing of the criteria see subpart 3441.1.

(1) On Federal lands administered by the Bureau of Land Management, an unsuitability determination will be made as part of the land use planning process using both environmental and resource management

criteria of the Bureau and reclamation and environmental criteria developed by the Office of Surface Mining.

(2) In cases where land use plans are prepared by other Federal agencies or State Governments and do not contain an unsuitability assessment, the Secretary shall conduct an assessment prior to lease sale. This assessment shall provide for public consultation during the process.

(3) When it is determined that an area is unsuitable for all or certain types of surface coal mining operations, the Secretary shall either withhold such area from leasing or condition any mineral lease to protect the values involved.

(4) The Secretary shall consult with appropriate State and local officials and agencies prior to officially designating any area as unsuitable for coal mining.

(5) (i) an acceptable land use plan shall include (A) a statement of the results of applying the unsuitability criteria in Subpart 3441 to the lands in the planning area addressing each of the criteria, (B) a description of any area determined unsuitable for leasing under those criteria, and (C) a description of any areas that have or may have non-mineral values that would lead to a determination of unsuitability for leasing and that are not determined unsuitable for leasing because detailed data are lacking or because mitigating or protective measures are or may be available to protect the non-mineral values involved. The description shall be accompanied by

a statement of the reasons for making the exception and the lease stipulations required to protect the non-mineral values or the data gathering action needed to make a final determination regarding the unsuitability of the areas for leasing.

(ii) Where there is insufficient data on an area to determine whether an unsuitability criterion applies, the authorized officer shall collect the maximum amount of pertinent data possible within the time and resources allotted for the planning process and (A) determine on the basis of the data accumulated that the area is unsuitable for leasing by applying the appropriate criterion or (B) determine that the preponderance of the data available indicates that the area is conditionally acceptable for leasing pending the collection of enough detailed data to make a firm determination.

(iii) The land use plan shall specify when in the planning or lease sale process any necessary data will be generated and the unsuitability criteria applied to conditionally acceptable areas. When the data are available and the applicable criteria applied, the authorized officer shall make public the determination regarding the acceptability of the lands for leasing.

(iv) No exception of lands from applicable unsuitability criteria shall be made solely upon the basis of the value of the coal resource involved. Exceptions may only be made under conditions that will insure the protection of the non-mineral values involved.

(c) A determination shall be made of the reclamation potential of all lands under consideration for leasing. If it has been determined with reasonable certainty that an area cannot be reclaimed to its present level of productivity or higher, that area shall not be considered further. The reclamation potential determination conducted at this stage shall be the first of three. Determinations of reclamation potential shall also be conducted prior to the offering of tracts for lease sale and prior to the granting of a mining plan permit. At each successive state any more detailed site-specific data available shall be used in making the determinations. The land use planning determination shall only be intented to eliminate the more obvious problem areas from further consideration.

(d) Multiple land use decisions may be made eliminating coal areas from further consideration to protect other resource values of a unique, site-specific nature clearly superior to coal but not included in the unsuitability criteria discussed in paragraph (b) of this subsection. Examples of such resource values are prime recreation sites and campgrounds.

(e) Agencies preparing land use plans shall consult with surface owners whose lands overlie Federal coal resources deposits under consideration for leasing.

(1) If the surface owner indicates a definite preference against the leasing of the deposit underlying the private surface, that portion of the deposit shall be eliminated from further consideration. Should the surface owner not wish to have the deposit eliminated from further consideration, the owner shall still retain the right

to veto leasing of the coal deposits under the surface at the time surface owner consent is sought under section 3432.1.

(2) Areas in which a significant number of surface owners have expressed a preference against leasing shall not be eliminated from further consideration for leasing during the land use planning. Any such area shall be noted in the land use plan documentation and shall not be offered for lease sale unless there are no acceptable alternative areas available to meet production targets within the production region.

(e) The land use planning agency may recommend maximum levels or rates of coal development for the areas designated acceptable for further consideration for leasing.

§ 3430.2-5 Consultation and public hearing.

Under the provision of this subsection, agencies preparing land use plans shall:

(a) consult with appropriate State and local governments and the general public during the preparation of the plan,

(b) conduct a public hearing on the proposed plan before it is adopted if such a hearing is requested by any person who may be adversely affected by the adoption of the plan.

§ 3430.2-6 Hearing Requirements.

The agency conducting the hearing shall:

(a) publish a notice of the hearing in a newspaper of general circulation at least once in each of two consecutive weeks in the affected geographical area;

(b) provide an opportunity for testimony by anyone who desires to do so; and

(c) record the proceedings of the hearing so that a complete transcript of the hearing can be compiled if requested.

§ 3430.2-7 Consultation with Federal surface managing agency.

(a) The Secretary may not issue leases for lands the surface of which is under the jurisdiction of any agency other than the Department of the Interior unless the Federal agency has consented to the issuance of the lease. Any lease issued shall contain the terms and conditions that the head of the agency may prescribe for the use and protection of the nonmineral interests in those lands.

(b) The Secretary may prescribe additional terms and conditions that are consistent with the terms proposed by the surface managing agency to protect the interest of the United States and to safeguard the public welfare.

§ 3430.3 Regional production targets.

§ 3430.3-1 General.

(a) The Secretary shall establish regional coal production targets for the purpose of setting Departmental budget priorities, aiding the States in planning for potential future impact of coal development, and supplying guidance for establishing proposed coal sale schedules. The regional production targets are considered in establishing the areas acceptable for leasing discussed in section 3430.2 of this part.

(b) To evaluate and compare impacts of coal development and for other planning purposes, the Secretary shall divide the federally owned coal resource into geographic regions. These regions may be changed or modified as required to meet planning needs.

§ 3430.3-2 Evaluation of coal needs.

(a) The Secretary, in consultation with the Secretary of the Department of Energy, affected State Governors, and other concerned parties, shall establish regional production targets.

(b) The Secretary shall first propose preliminary production targets for each designated region, using various data sources, including the Department of Energy's coal production forecasts. These targets shall be for 5, 10, and 15 years. In estimating regional targets for total coal production, the expected and potential production from existing Federal coal leases, noncompetitive coal lease applications, and Federal coal holdings shall be evaluated.

Preliminary regional targets for coal production shall reflect the difference between projected coal demand and supplies. Consideration shall also be given to the relative economic, social, and environmental differences between the coal regions, the benefits of developing Federal versus non-Federal coal, and other factors.

(c) The Secretary shall discuss the preliminary regional coal production targets with the Governors of affected States seeking their views about the adequacy of the estimates and suggested revisions. The coal industry, environmental groups, and other concerned parties shall also be consulted at this time.

(d) After the consultation period, the Secretary shall revise the preliminary regional production targets in response to State concerns and input from industry and the general public.

(e) The Secretary shall revise regional coal production targets every two years. Targets and supportive analysis shall be made available to the public.

(f) The establishment of regional production targets shall not prevent the Secretary from accepting and accommodating specific needs in emergency leasing situations.

§ 3430.3-3 Use of final regional production targets.

The regional product targets shall be used to establish priority planning areas and to guide budget and personnel planning and Federal coal exploration programs. These targets do not represent final leasing decisions and will be subject to change as a result of industry needs, socioeconomic, environmental, and other factors taken into consideration during the ranking, selection, and scheduling process as per section 3430.4-4.

§ 3430.3-4 Environmental assessment.

An environmental assessment in the form of an updating of the coal programmatic environmental impact statement shall be conducted by the Secretary if:

(a) The regional production targets established in accordance with this section vary significantly from those analyzed in the most current version of the coal programmatic statements or

(b) The Secretary has reason to believe that the tracts available for selection in the next round of the ranking, selection, and scheduling (see section 3430.4-4) in any given region(s) may generate significantly different levels or types of environmental impacts than were anticipated in the most current coal programmatic statement for that level of production.

§ 3430.4 Specific tract identification (Activity Planning).

§ 3430.4-1 Identification process.

This section describes the process for identifying and selecting coal lease tracts after land use planning has been completed. This process constitutes the "coal activity planning" aspect of the overall coal management program. Coal activity planning occurs in those areas (a) (1) where areas acceptable for further consideration for leasing have been delineated in the Bureau of Land Management's land use planning process or (2) where other acceptable planning has been undertaken and (b) where coal leasing and development is not incompatible with the plans once the "unsuitability criteria," have been applied in accordance with subpart 3441.

§ 3430.4-2 Expression or indication of leasing interest.

(a) A call for an indication of leasing interest may be made after "areas acceptable for further consideration for leasing" have been identified through the Bureau of Land Management's planning. A call may also be made in other areas having acceptable planning completed by other Federal agencies or State governments as per the provisions of section 3430.2. The call may be made in any one, several or all of the above mentioned areas when the Secretary determines that additional Federal coal should be made available to meet local, State, or national needs.

(b) In formal expressions of interest may be submitted during the planning process or whenever a mining company may wish to indicate an interest in Federal coal in a particular area. This expression of interest shall be in the form of a general letter to the Secretary. The Secretary may use this information for planning purposes or to determine the need for initiating the formal "specific tract identification" process where land use planning has previously occurred.

(c) Any individual, business, industry, or public institution may express an interest in leasing when the Secretary issues a call for indications of leasing interest,

(d) Qualifying entities for "public body" leasing as defined in section 3430.1-4 of this part shall make their intentions known through an indication of leasing interest when called for by the Secretary.

(e) All calls for indications of leasing interest shall include data supporting the expression of interest. Such data may include (but are not limited to) location and quantities of coal desired, time needed, proposed use of coal, technical coal data, commitments with private surface and coal owners and adjacent landowners or lessees, and basic development proposals.

(f) Public inspection and copying of information submitted under this subpart shall be governed by the procedures in 43 CFR Part 2.

(g) Notice of each request for an indications of leasing interest shall be published in the FEDERAL REGISTER and in the newspaper(s) of general circulation in the affected State. This notice of request shall specify the area or areas involved, information required, the period of time within which expressions may be submitted, where to write for further information, and where to submit the expressions.

§ 3430.4-3 Preliminary tract identification.

(a) The Secretary shall identify potential tracts based on the following factors:

(1) Technical coal data, including reserve tonnage, rank, sulfur content, seam thickness, and ratio of recoverable coal to reserves;

(2) Conservation considerations, including calculation of maximum economic recovery, land ownership patterns, and the formation of logical mining units;

(3) Expressions of interest and existing or planned operations on adjoining lands;

(4) Surface ownership, including the results of surface owner consultation, and the existence of surface owner consents and their terms.

(b) The Secretary shall identify the potential tracts in accordance with the section 3401.3 of this part or by seam(s) or coal bed(s), or both.

(c) When public bodies have expressed interest in leasing, tracts to meet those needs may be designated when and where technically feasible in accordance with section 3430.1-4 of this Part.

(d) In cooperation with the Small Business Administration, tracts may be designated when and where technically feasible for small business special opportunities in accordance with section 3430.1-4 of this Part.

§ 3430.4-4 Regional tract ranking, selection, and scheduling.

If the regional production target established for any given region suggests a need for additional Federal coal leasing, a proposed lease sale schedule shall be formulated. Before a schedule is established, all available tracts identified under section 3430.4-3 within the region shall be ranked by priority using such criteria as coal economics, ease of reclamation, proximity to existing transportation facilities, surface owner preferences and socioeconomic and other environmental concerns. The production potential of ranked tracts shall be compared with the desired level of production and a set of tracts shall be selected for a proposed lease sale schedule. As the potential environmental and social impacts which would result from development of several tracts in the same area might be cumulative, the selection of one tract might lower the priority of the other tracts in the same area. As a result, the selected tracts may not directly correspond to the relative order in which the individual tracts were originally ranked. The number of tracts proposed shall be dependent on the type of bidding system to be used (as per section 3432.3-2 of this Part) and the tonnage targeted for lease. The selected tracts shall then be placed into a proposed lease sale schedule.

(a) The ranking and selection process shall be done by the Secretary in consultation with the Governor(s) within whose State(s) the region is located and in consultation with representatives of all affected Federal surface managing agencies. The Secretary shall involve the public, local communities, industry, and other interested parties before tract ranking and selection.

(b) A notice of intent to rank and select tracts to be included in a proposed lease sale schedule, shall be published in the FEDERAL REGISTER and selected newspapers of general distribution within the region no less than 30 days before the ranking process begins. The notice shall contain a description of the tracts to be ranked and procedures under which any interested parties are to be involved in the process.

(c) The results of the process, including the tract rankings, the tracts selected, the proposed schedule, and the list of criteria used shall be published in the same publications in which the notice of intent was published, under subsection (b), within 30 days after the results of the process have been accepted by the Secretary. Detailed information on each of the tracts ranked will be available for inspection in the Bureau of Land Management offices that have jurisdiction within the region, see Title 43 CFR 1821. Those parties interested in commenting on the results of the tract ranking and selection process shall have the opportunity to do so in the environmental assessment process (section 3430.4-5) prior

to any final decision by the Secretary, to hold a lease sale encompassing any of the selected tracts.

(d) The ranking and selection process shall normally be repeated every two years in accordance with the need identified by the updated regional production targets. The Secretary may in consultation with the Governor(s) of the affected States and surface managing agencies initiate or postpone the process to respond to considerations such as major planning updates, new preliminary tract identifications, and increases or decreases in the level of leasing.

(e) To establish planning and inventory related priorities, the Secretary may include in the ranking process areas suitable for coal leasing that have not been designated or defined as preliminary lease tracts. Provided all tracts subsequently identified for lease consideration are formally entered into the ranking and selection process before they are included in a lease sale proposal, these areas may be treated informally. It is unnecessary to include them in the notices of intent and in the results discussed under paragraphs (b) and (c) of this section.

Section 3430.4-5 Environmental assessment (Reserved).

§ 3430.4-6 Public meetings on proposed tracts.

After the draft regional environmental assessment has been completed and an initial decision on the tracts to be offered for lease has been made, a public meeting shall be held in the region affected to announce the coal evaluation findings, the proposed lease sale schedule, and the potential impacts, including proposed mitigation measures.

§ 3430.4-7 Adoption of regional coal lease sale schedule.

(a) After the actions required in this section have been completed, after the States and surface management agencies have been consulted, and after the public meeting has been held in the area potentially affected by the proposed coal lease sale, the BLM State Director(s) shall recommend a schedule for the sale of the suitable, tentative coal lease tracts to the BLM Director. The Director shall consolidate approved field recommendations into a proposed Coal Lease Sale Schedule for the Secretary's review and approval.

(b) The Director's recommendation and the Secretary's final approval, shall include a written synopsis of earlier analyses.

Subpart 3432 - Presale and sale procedures.

§ 3432.1 Split estate leasing. [Reseerved]

§ 3432.2 Presale procedures.

§ 3432.2-1 Consultation with surface management agency.

Where the surface is managed by another Federal agency the Secretary shall obtain the final concurrence of the surface management agency prior to offering a coal lease for competitive sale.

§ 3432.2-2 Consultation with Governor.

(a) If the Governor of a stae has not agreedto the offering of a lease for competitive sale during the E.I.S. procedure, the Secretary shall consult the Governor of the State in which the land to be leased

is located. The Secretary shall give a specified period of time to comment, not less than 30 days or more than 60 days, before issuing a notice of offering.

(b) When a lease proposal would permit surface mining within the boundaries of a National Forest, the Governor of the State in which the land to be leased is located shall be so notified by the Secretary. If the Governor fails to object to the lease proposal in 60 days, the Secretary may issue the lease. If within the 60 day period the Governor notifies the Secretary, in writing, of an objection to the lease proposal, the Secretary may not approve the lease for six months from the date that the Governor objects to the lease. The Governor may, during this six-month period, submit a written statement of reasons why the lease should not be issued, and the Secretary shall, on the basis of this statement, reconsider the lease proposal.

§ 3432.2-3 Notice of lease sale.

(a) Prior to the lease sale, the authorized officer shall publish a notice of the proposed sale in the FEDERAL REGISTER and in a newspaper(s) of general circulation in the county in which the lands are situated. The newspaper notice shall be published once a week for four consecutive weeks. Such notice shall also be posted in the BLM State office and mailed to the surface owner, if other than the United States, to appropriate Federal and State agencies, and to the clerk or other appropriate officer in the county in which the proposed operation is located for posting or publication in accordance with the procedures of that office. No final action shall be taken for a period of 30 days after such posting and mailing.

(b) The notice shall (1) Show the time and place of sale; whether the sale will be by sealed bids, oral bids, or combination of both; the description of the land, and the place where a detailed statement of the terms and conditions of the lease offer may be obtained; (2) Contain a request for comments on the fair market value of the tracts to be sold; the notice shall state the address for submitting comments on fair market values; and (3) Contain a detailed statement concerning the availability of documents.

(c) The detailed statement shall (1) Set forth the terms and conditions of the sale, including the manner in which the bids may be submitted;

(2) Contain a statement that sealed bids may not be modified or withdrawn unless the modifications or withdrawals are received prior to the time fixed for opening the bids;

(3) Contain a warning to all bidders concerning 18 U.S.C. 1860, which prohibits unlawful combination or intimidation or bidders;

(4) Specify that the Government reserves the right to reject any and all bids and the right to offer the lease to the next highest qualified bidder if the successful bidder fails to obtain the lease for any reason. If the sale is by oral bid, the statement of terms and conditions of the sale will also specify that sealed bids may be submitted. If any bid is rejected, the deposit will be returned;

(5) Contain a request for comments on the fair market value of

the tracts to be sold. The notice shall state the address for submitting comments on fair market value;

(6) Contain a request for information required by the Attorney General and bidder qualifications;

(7) Require the derred bonus payment, if necessary; and

(8) Contain a copy of the proposed lease, including all stipulations.

§ 3432.3 Economic evaluation.

Before the lease sale, the U.S. Geological Survey, considering public comments on fair market value and available geotechnical, engineering and economic data, shall make a coal resource economic evaluation of each tract to be sold and shall submit this evaluation to the authorized officer.

§ 3432.3-1 Mineral evaluation.

When the tract selection has been completed, the authorized officer shall request a mineral evaluation and mining method determination from the Geological Survey. When the mineral evaluation request is received, the Geological Survey shall determine the coal resource economic value and the maximum economic recovery for the lands under consideration. The mineral evaluation includes the consideration of coal quality and quantity, probable mining method, costs, prices, logical mining units, and other appropriate elements.

§ 3432.3-2 Public hearing.

(a) When the mineral evaluation has been completed, the Geological Survey shall conduct a public hearing on maximum economic recovery in the area. The notice of the public hearing shall contain a request for comments on determining fair market value. The notice will include the appropriate USGS address to which the fair market value comments should be directed and the deadline for submittal.

In conducting the public hearing the Geological Survey shall:

(1) publish a notice of hearing in a newspaper of general circulation at least once in each of three consecutive weeks in the affected geographical area,

(2) provide anyone an opportunity to testify, and

(3) compile a transcript of the hearing on maximum economic recovery.

(4) This hearing may be held in conjunction with the Surface Management Agency's public hearing on impacts of the proposed lease sale.

(b) Following the public hearing, the Geological Survey shall forward to the authorized officer all public comments on the fair market value and the results of the mineral evaluation. These results shall include the coal resource economic value, mining method evaluation, estimated recoverable reserves, coal quality assessment, royalty bond recommendations, and reclamation fees that would be generated by mining the proposed lease.

§3432.3-3 Fair market value determination.

When the coal resource economic value and accompanying information are received, the authorized officer shall use this information and access the public comments before determining the fair market value of the proposed lease. Minimum bonus bids shall be $25 per acre. Fair market value requirements shall be the same for both public body and regular competitive leasing. All financial terms shall be the same for either entity. When fair market value has been determined, the authorized officer shall inform the Geological Survey of the determination.

§ 3432.4 Sale procedures.

§ 3432.4-1 Conduct of sale.

Bids will be received only until the hour on the date specified in the notice of competitive leasing; all bids submitted after that hour shall be rejected. The authorized officer shall read all sealed bids. If the procedure calls for sealed bids followed by oral bids, the oral bidding shall begin at the level of the highest sealed bid. After the oral bidding has ceased, the highest bid shall be announced. No decision to accept or reject the high bid will be made at this time. The sale shall be adjourned and the sale panel shall convene to determine if the high bid adequately reflects fair market value considering, among other factors, the comments on fair market value, as stipulated in (b) (v) of 3432.3-3.

The recommendations of the panel shall be sent to the authorized officer who will make the final decision to accept a bid or reject all bids. The successful bidder shall be notified in writing. The Department reserves the right to reject any and all bids. The Department reserves the right to offer a lease to the second high bidder if the successful bidder fails to execute the lease. When the sale is by oral bidding, before bidding is commenced, the authorized officer conducting the sale shall open and read the sealed bids. The successful oral bidder, and each sealed bidder shall submit the following with the bid: certified check, cashier's check, bank draft, money order, personal check or cash for one-fifth of the amount of the bid, and a statement over the bidder's own signature with

respect to citizenship and interests held, similar to that prescribed in Subpart 3402.

§ 3432.4-2 Other bid systems.

The use of bidding competition between tracts (intertract bidding) is authorized when and if the Bureau of Land Management and the U.S. Geological Survey determine it is needed in the public interest. The authorization to use intertract competition does not preclude the use of any other form of competitive bidding procedure.

§ 3432.4-3 Unsurveyed lands.

If the land is unsurveyed, the successful bidder shall not be required to comply with the requirements for lease issuance until the land has been surveyed. See 3401.3-2.

§ 3432.4-4 Consultation with Attorney Genral.

(a) Subsequent to a lease sale, but prior to issuing a lease, the authorized officer shall notify the Attorney General of the proposed lease issuance, the proposed lessee, normally the high bidder in a sale, and other relevant information. The authorized officer may not issue a lease until 30 days after the Attorney General is notified.

(b) The authorized officer shall not issue the lease to the proposed lessee if, during this 30-day period, the Attorney General notifies the authorized officer that the proposed lease issuance would create or maintain a situation inconsistent with the anti-trust laws.

(c) If the Attorney General notifies the authorized officer that a lease should not be issued, the authorized officer may:

(1) Reject all other bids or may notify the Attorney General in accordance with paragraph (a) of this section that issuance of the proposed lease to the next qualified high bidder is under consideration; or

(2) Issue the lease if, after a public hearing is conducted on the record in accordance with the Administrative Procedures Act, the authorized officer determines that: (i) Issuance of the lease is necessary to carry out the purposes of the Federal Coal Leasing Amendments Act of 1975; (ii) Issuance of the lease is consistent with the public interest; and (iii) There are no reasonable alternatives to the issuance of the lease consistent with the Federal Coal Leasing Amendments Act of 1975, the anti-trust laws, and the public interest.

(d) If the Attorney General does not reply in writing to the notification in paragraph (a) of this section within 30 days, the authorized officer may issue a lease without waiting for the advice of the Attorney General.

§ 3432.5 Award of lease.

(a) Four copies of the lease form shall be sent to the successful bidder. These forms shall be completed and returned within 30 days of receipt. In addition, the bidder shall, within the 30-day period,

pay the balance of the bonus bid if required, the first year's rental, and file a bond as required by Subpart 3404.

(b) If the bidder dies before the lease is issued, the provision found in 3402.2-3 will apply.

(c) All competitive coal lease sales shall be held on a deferred bonus payment basis. In a deferred bonus payment, the lessee shall pay the bonus payment in five (5) equal installments: The first installment shall be submitted with the bid. The balance shall be paid in equal annual installments due and payable on the next four anniversary dates of the lease. If a lease is relinquished or otherwise terminated, the unpaid remainder of the bid shall be immediately payable to the United States.

Subpart 3435 - Emergency Leasing System

Sec.

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AUTHORITY: 30 U.S.C. 181 et seq.

## Subpart 3435 - Emergency Leasing System

§ 3435.0-1 Purpose.

This subpart provides for an application process as a part of the normal leasing system, to enable coal developers to identify emergency needs for Federal coal that may be subject to lease pursuant to this Part 3400.

§ 3435.0-2 Objective.

This Subpart allows coal producers, who demonstrate an urgent need for Federal coal, an application process through which the Department may consider holding coal lease sales outside the normal long range tract selection process. Leasing proposals developed by this application process differ from those that originate through the normal selection process only with respect to (1) the method of tract identification and (2) the degree of scope required in the planning and environmental assessment process. This subpart shall be administered so as to maintain the integrity of the normal long term leasing process.

§ 3435.1 Applications: Emergency needs.

Applications for coal leases covering lands subject to leasing (Subpart 3401) may be filed with the authorized officer in the BLM State Office having jurisdiction over the lands or minerals involved. (See subpart 1821 of this title).

§ 3435.1-1 Form.

Applications for emergency coal leasing shall be filed on a form approved by the Director, Bureau of Land Management. Three copies of the application and preliminary and other data required by this Subpart shall be submitted with the initial filing.

§ 3435.1-2 Preliminary data.

(a) Any application for a coal lease filed in accordance with the regulations in this Chapter shall contain preliminary data to assist the authorized officer in making a technical examination and environmental assessment as described in § 3430.4-5.

(b) Such preliminary data shall include: (1) a map, or maps, (which may be available from State or Federal sources) showing the topography of the land applied for, and on which the applicant shall show the physical features and natural drainage patterns and existing roads, vehicular trails, and utility systems; the location of any proposed exploration operations, including seismic lines, drill holes, to the extent known, the location of any proposed mining operations and facilities, trenches, access roads or trails, and supporting facilities including the approximate location and extent of the areas to be used for pits, overburden, and tailings; and the location of water sources or other resources that may be used in the proposed operations and facilities.

(2) A narrative statement, including: (i) The anticipated scope, method, and schedule of exploration operations, including the types of exploration equipment to be used.

(ii) The method of mining anticipated, including the best estimate of the mining sequence and production rate to be followed.

(iii) The relationship between the mining operations anticipated on the lands applied for and existing or planned mining operations, or support facilities on adjacent Federal or non-Federal lands.

(iv) A brief description, including maps or aerial photographs as appropriate, of the existing land-use within and adjacent to the lands applied for; and of known geologic, visual, cultural, or archaeological features; and the known habitat of fish and wildlife, particularly threatened and endangered species, that may be affected by the proposed or anticipated exploration or mining operations a related facitities.

(v) A brief description of the proposed measures to be taken to: control or prevent fire, soil erosion, pollution of surface and ground water, damage to fish and wildlife or other natural resources, air and noise pollution, and hazards to public health and safety; reclaim the surface; and meet other applicable laws and regulations. The applicant may submit other pertinent information that the applicant wishes to have considered by the authorized officer.

(c) The applicant shall not undertake any operations on the land except for "casual use," without prior authorization. Casual use, as used in this section, excludes activities that cause significant surface disturbance or damage, as determined by the authorized officer, to lands, resources, and improvements, such as using (1) heavy equipment or explosives, or (2) any vehicle that could disturb the land beyond the use of established roads and trails.

(d) The authorized officer, after reviewing the preliminary data contained in an application, and at any time during a technical examination and environmental assessment, may request additional information from the applicant.

§ 3435.1-3 Qualifications of the applicant

(a) Any applicant under this Subpart shall meet the qualifications required of a lessee as specified in Subpart 3402 of this Part.

(b) In addition, a lease proponent under this Subpart shall provide (1) data necessary to show that the application conforms to the conditions of acceptance specified in 3435.2, (2) where the surface of the land is not owned by the Federal Government, documents necessary to show ownership of surface, or (3) where the legal owner of the surface is a qualified owner under Sec. 714 of the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1304), a showing that the surface owner consents, and title evidence to such land surface showing that the consent is conveyed by the legal owner.

§ 3435.1-4 Rejection of applications.

(a) Applications for coal leases may be rejected in total or in part when (1) it is determined that the application is not consistent with conditions for holding a coal lease sale specified in 3435.2, (2) the lands listed in the application are not available for coal leasing under subpart 3401 of this chapter, (3) some or all the lands applied for are determined to be (i) unsuitable for leasing under provisions of subpart 3441, (ii) within an identified area of critical environmental concern; (4) the applicant cannot qualify as defined in 3435.1-3 to hold a lease under this Part; (5) preliminary data required under 3435.1-2, including additional information specifically requested in writing by the authorized officer, is found to be insufficient to determine whether the lease proposal meets the conditions for leasing, and to complete required land-use analyses satisfactorily, the technical examination, and the environmental assessment, and (6) where the lease would violate the integrity of the normal long range leasing process, and (7) it is determined by the authorized officer after thorough investigation of the issues involved that leasing of the lands covered by the application, for environmental or other sufficient reasons would be contrary to the public interest.

(b) Applications defective subject to rejection under 3435.1-4(a)(5) may be corrected. The applicant shall be given an opportunity to provide requested information within a reasonable time as specified in a decision issued for that purpose.

§ 3435.2 Conditions of acceptance.

(a) A coal lease will be held in response to an application under this subpart only if the applicant can show:

(1) Either (i) the Federal coal is needed within three years to sustain an existing mining operation at the average annual level of production or new committed level of production on the date of application, as substantiated by a mining sequence plan and projected production levels; or

(ii) in an existing mining operation, the Federal coal will be permanently bypassed for the reasonably foreseeable future and some portion of the tract will be utilized within three years as substantiated by a mining sequence plan and stated proposed production levels; or

(iii) the Federal coal will be mined within three years in the process of obtaining economic access for development of private or leased coal; and (2) both for existing operations;

(i) the existing mining operation for which coal is needed has been producing coal for at least two years before the date of application; and

(ii) the need for coal shall have resulted from circumstances beyond the control of the applicant or that he could not have reasonably foreseen and planned for.

(b) The tract to be offered for lease shall be so much of the lands applied for as necessary to meet the emergency need of the applicant without violating the integrity of the normal long term leasing process.

§ 3435.3 Diligence on emergency leases. (Reserved)

§ 3435.4 Land use plans.

No coal lease shall be issued under this Subpart unless the lands have been included in a comprehensive land use plan, as required in § 3430.3 or in a land use analysis pursuant to 43 CFR 1601.5-3. All emergency leasing decisions shall be consistent with the appropriate land use plan or analysis.

§ 3435.5 Environmental review.

Before a lease sale will be held in response to an application filed under this Subpart is issued:

(a) The authorized officer shall, in accordance with 43 CFR 3430.4-5, do an environmental analysis and technical examination of the potential effect of such coal lease on the resources of the area and its environment, including fish and other aquatic resources, wildlife habitats and populations, visual resources, recreation, cultural, and other resources in the affected area.

(b) If based upon the environmental assessment done under subparagraph (a) the authorized officer determines that an environmental impact statement is required under the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)), either a statement shall be prepared or the authorized officer may determine that because of critical environmental considerations or limitations in rehabilitation potential, it would not be in the public interest or the interest of the lease proponent to consider the application in accordance with this Subpart.

(c) For lease applications involving National Forest System lands, the authorized officer shall submit the lease application to the Secretary of Agriculture for consent, and the attachment of appropriate stipulations to the lease. (See 43 CFR 3401).

§ 3435.6 Presale and sale procedures.

Subpart 3432 will apply to all leases offered for sale under the provisions of subpart 3435.

# PART 3440 - ENVIRONMENT AND SAFETY

## Subpart 3441 - Unsuitability for Leasing

Section


3441.0-6 Policy.

3441.1 Criteria, unsuitability for surface coal mining operations.

3441.2 Relation of leasing to unsuitability determinations.

3441.3 Exploration.

3441.4 Designation procedures.

3441.4-1 Consultation with local governments.

3441.4-2 Findings.

3441.4-3 Petitions to designate lands.


## Subpart 3445 - Surface Management and Protection

Section


3445.0-1 Purpose.

3445.0-2 Objective.

3445.0-3 Authorities.

3445.0-4 Responsibilities.

3445.0-5 Definitions.

3445.0-7 Applicability.

3445.1 Use of surface.

3445.2 Obligations and standards of performance.

3445.3 Bonding.

3445.4 Conduct, completion, and abandonment of properties.

3445.5 Inspections.

3445.5-1 Discovery of noncompliance.

3445.5-2 Failure of operation to act.

3445.6 Alternative postmining land use.

3445.6-1 Environmental statements.

Subpart 3441 Unsuitability for Leasing

Section 3441.0-6 Policy.

(a) Determinations regarding the unsuitability of Federal lands and minerals for exploration, leasing, and development shall be made through an acceptable land use planning process by the surface management agency.

(b) Any criteria regarding the unsuitability of lands for surface coal mining necessary to ensure compliance with the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.) established by the Office of Surface Mining. Shall be used in addition to criteria in this subpart in unsuitability determinations made through the planning system.

3441.1 Criteria, unsuitability for surface coal mining operations.

(Reserved -- to be supplied)

3441.2 Relation of leasing to unsuitability determinations.

(a) No tract of Federal coal which has been designated as unsuitable for all types of surface coal mining operations shall be considered for leasing under subparts 3430 and 3435 of this part.

(b) On any tract of Federal coal which has been designated unsuitable for certain types of surface coal mining operations, the Secretary will condition any leasing to prohibit all types of surface coal mining operations for which the lands have been designated unsuitable.

3441.3 Exploration.

(a) Designation of any area as unsuitable for all or certain types of surface coal mining operations pursuant to sections 522 and 523 of the Surface Mining Control and Reclamation Act and the regulations of this subpart does not prohibit exploration of such area for coal under subpart 3410.

(b) Exploration on any lands designated unsuitable for surface coal mining operations must be approved by the State regulatory authority pursuant to part 776 to ensure that exploration does not interfere with any value for which the area has been designated unsuitable for surface coal mining.

3441.4 Designation procedures.

3441.4-1. Consultation local governments.

Prior to designating Federal lands unsuitable for all or certain types of surface mining operations, the Secretary shall consult with the appropriate State and local agencies.

3441.4-2 Findings.

Prior to designating Federal lands unsuitable, the Secretary shall prepare a detailed statement on (i) the potential coal resources, (ii) the demand for coal resources, and (iii) the impact of such designation on the environment, the economy, and the supply of coal.

3441.4-3 Petitions to designate lands.

Petitions for designation or termination of a designation of lands as unsuitable for surface coal mining operations shall be processed by the Office of Surface Mining under 30 CFR 769.

Subpart 3445 - Surface management and protection.

Section 3445.0-1 Purpose.

The purpose of this subpart is to establish rules for the management and protection of the surface of the Federal coal lands when coal resources are developed.

Section 3445.0-2 Objective.

The objective is to ensure effective and reasonable coal mining operations, and reclamation of mined lands in a manner that will minimize any adverse social, economic, and environmental effects of the coal mining operations.

Section 3445.0-3 Authorities.

See section 3400.0-3.

Section 3445.0-4 Responsibilities.

(a) The Bureau of Land Management (BLM) has the responsibility:

(1) to exercise the authority of the Secretary to determine the acceptability of public lands for mineral leasing and development.

(2) to issue mineral leases and serve as the Office of Record for the Federal mineral leasing programs.

(3) to issue and administer all use authorizations for facilities related to mineral development outside the immediate area of mining operations.

(4) to determine, in consultation with the Office of Surface Mining, the appropriate postmining land use of surface mined lands.

(5) to include terms in each mineral lease to protect nonmineral resources and to ensure reclamation of mined lands to the applicable standards.

(6) to take action to cancel leases for noncompliance with lease terms.

(7) to consult with other surface management agencies and private owners, when they are involved in or affected by actions that are the primary responsibility of the BLM.

(8) to administer exploration licenses.

(b) The Geological Survey (GS) has the responsibility:

(1) to exercise the authority of the Secretary with respect to production and resource recovery in the area of operations.

(2) to make geologic, engineering, and economic value determinations for the Department's mineral leasing program.

(3) to review and concur with mining and exploration plans and amendments to establish production and resource recovery requirements.

(c) The Office of Surface Mining Reclamation and Enforcement (OSM) has the responsibility:

(1) to approve mining and reclamation permit applications.

(2) to ensure that mining operations are consistent with environmental criteria and reclamation plans.

(3) to monitor reclamation operations for compliance with plans.

(4) to act as the Secretary's representative in dealing with the operator during mining and reclamation operations.

(5) to ensure that the rights of holders of noncoal Federal leases and permits are protected in the permit approval process.

Section 3445.0-5 Definitions.

As used in this subpart:

(a) "Permit area" means that area of the leased or licensed land that is required for surface coal mining operations including development, producing, and processing and all related on-site surface structures and facilities. The permit area is delineated on a map or plat and is part of an approved permit.

(b) "Authorized officer" means any employee of the Bureau of Land Management to whom has been delegated the authority to perform the duties described in this subpart.

(c) "Permit application" means a detailed plan for the surface minin of the coal resource and reclamation of mineral land submitted to the Surface Mining Office for approval prior to commencement of any surface mining operation, showing the proposed location, method, and extent of mining and related activities necessary and incidental to the operation, including steps to protect the environment during operations, to reclaim disturbed areas, to mitigate adverse impacts, and otherwise to meet the performance standards in 30 CFR Subchapter D.

(d) "Mining Supervisor" means the Area; Conservation Division, Geological Survey, or District Mining Supervisor or a subordinate acting under the supervisor's direction.

(e) "Operator" means a lessee or one conducting operations on a coal lease area under the authority of the lessee.

(f) "Surface Mining Office" means the field representative authorized to act for the Director of the Office of Surface Mining.

(g) "Licensed land" means land from which coal is removed in accordance with 30 U.S.C. 208.

Section 3445.0-7 Applicability.

This subpart applies to leases and licenses issued by the Bureau of Land Management for the development of Federal coal.

Section 3445.1 Use of surface.

(a) The operator shall use only that part of the surface area included in his lease or license that has been included in an approved permit.

(b) Separate permits under appropriate provisions in Title 43 are required for the installation of power generation plants, commercial or industrial facilities on, or for the use of mineral materials or timber from the lease lands.

(c) Other land uses under other authorities may be authorized on an area leased or licensed for coal development provided there is no unreasonable conflict and that neither operation is endangered by the presence of the other.

Section 3445.2 Obligations and standards of performance.

(a) Any operator who accepts a coal lease or license shall comply with the regulations in this subpart and with the terms and conditions of the lease or license.

(b) Applicable performance standards in 30 CFR subchapter D shall be complied with by the operator.

(c) When changed conditions or newly discovered information indicate that an approved mining permit needs to be revised or supplemented, the authorized officer may propose the appropriate revision or supplement to the Surface Mining Office.

(d) The authorized officer may develop and include additional specific stipulations in any lease or license involving special management considerations.

Section 3445.3 Bonding.

(a) Bonding regarding compliance with coal lease or license terms shall be furnished in accordance with the applicable provisions of section 3404 of this title.

(b) A Reclamation Bond shall be secured in accordance with 30 CFR 742.

(c) An application for a lease or license may be denied any applicant who has previously forfeited a bond because of failure to comply with an approved plan or permit unless the affected lands covered by that plan or permit have been reclaimed without cost to the Federal Government. Nothing in this subparagraph shall modify or limit the discretionary authority of the authorized officer to deny for other cause any application for a lease or license.

Section 3445.4 Conduct, completion, and abandonment of operations.

All terms of the operations permit shall be administered under 30 CFR Subchapter D.

Section 3445.5 Inspections.

The authorized officer, Mining Supervisor, or inspectors from the Office of Surface Mining shall have the right to enter lands under a Federal coal lease or license at any reasonable time.

Section 3445.5-1 Discovery of noncompliance.

(a) Upon discovery of activities by an operator that are not in compliance with lease or license terms and with an approved permit, and that do not pose a serious and immediate threat to public health and safety or to resources and environmental quality, the authorized officer shall refer the matter to the Surface Mining Office for remedial action.

(b) Upon discovery of activities by an operator that are not in compliance with lease or license terms or with an approved permit and that pose serious and immediate threat to public health and safety or to resources and environmental quality, the authorized officer may order the immediate cessation of the threatening activities, provided that the Surface Mining Office is immediately informed of any emergency cessation order issued.

Section 3445.5-2 Failure of operator to act.

Failure of an operator to comply with an emergency cessation order issued under section 3445.5-1(b) of this subpart or with a written notice of noncompliance issued by the Surface Mining Office in accordance with 30 CFR 211 or 30 CFR Subchapter D shall be grounds for suspension of the operation permit and may be grounds for cancellation of the lease or license, in accordance with subpart 3452 of this title.

Section 3445.6 Alternative postmining land use.

When an applicant or operator proposes any postmining land use that is substantially different from the land use prior to exploration and mining, the Surface Mining Office, with the approval of the authorized officer of the appropriate surface management agencies, may approve such alternative postmining land use. The authorized officer shall not approve the alternative postmining land use unless:

(1) The proposed alternative postmining land use does not conflict with land use plans for the lease or license area and surrounding lands.

(2) The proposed alternative postmining land use is considered an equal or better economic or public use of the land as compared to the premining use of the land.

(3) The alternative postmining land use does not, as determined by the authorized officer, cause a significant adverse impact upon the aesthetic character of the land or the lives of people who inhabit the area immediately surrounding the leased or licensed land.

(4) Where the surface is privately owned, the legal owner of the surface approves of the alternative postmining land use.

Section 3445.6-1 Environmental statements.

If the Director of the Office of Surface Mining determines that a decision to approve any alternative postmining land use or alternative rehabilitation practices would constitute a major Federal action requiring an Environmental Statement under section 102(2)(C) of the National Environmental Policy Act, a statement shall be prepared by the Director.

# PART 3450 - MANAGEMENT OF EXISTING COAL LEASES

Subpart 3450 - Existing Leases - General

Subpart 3451 - Continuation of Lease Terms

Sec.

3451.1 Readjustment of lease terms.

Subpart 3452 - Relinquishments, Cancellations, and Terminations

Sec.

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3454.3-1 Application.

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PART 3450 - MANAGEMENT OF EXISTING COAL LEASES

Subpart 3450 - Existing Leases; General

Subpart 3451 - Continuation of Lease Terms

§ 3451.1 - Readjustment of lease terms

All coal leases issued prior to August 4, 1976, shall be subject to readjustment at the end of the first 20-year period following the issuance of the lease and at the end of each 10-year period thereafter. All coal leases issued after August 4, 1976, shall be subject to reajustment at the end of each 10-year period after issuance.

(a) The authorized officer shall notify the lessee of whether or not any readjustment of terms and conditions will be made. If feasible, notification will be made before the expiration of the initial 10- or 20-year period, as appropriate, or any succeeding 10-year period thereafter. If the lessee does not within 30 days after receipt of notice of any proposed readjusted lease terms from the authorized officer file either an objection to the proposed readjustment or a relinquishment of the lease, the readjusted terms shall be considered agreed upon. If the date on which a coal lease became liable for readjustment of terms and conditions occurred before August 4, 1976, but the authorized officer prior to that date neither readjusted the terms and conditions nor informed the lessee that no readjustment would be made, the terms and conditions of that lease shall be readjusted to conform to the requirements of the Federal Coal Leasing Amendments Act of 1975.

(b) The authorized officer shall require the lessee to furnish information for review by the Attorney General as required by section 27 of the Mineral Leasing Act of 1920, as amended, (30 U.S.C. 181(1)). The lease will be subject to cancellation if the lessee fails to furnish the required information within the time allowed.

Subpart 3452 - Relinquishments, Cancellations and Terminations

§ 3452.1 - Relinquishments.

§ 3452.1-1 General.

Upon a satisfactory showing that the public interest will not be impaired, the lessee may surrender the entire lease or any part thereof. Partial relinquishment shall describe clearly the surrendered part and give the exact acreage relinquished.

§ 3452.1-2 Where filed.

A relinquishment shall be filed by the lessee in the State Office of the Bureau having jurisdiction over the lands involved. (See 43 CFR 1821).

§ 3452.1-3 Acceptance.

Upon its acceptance, the relinquishment shall be effective on the date it is filed, subject to the continued obligation of the lessee and the surety to make payment of all accrued rentals and royalties and to comply with the regulations and terms of the lease.

§ 3452.2 Cancellations.

§ 3452.2-1 Judicial proceedings.

(a) The lessor, after compliance with paragraph (b) of this section, may institute appropriate proceedings in a court of competent jurisdiction for the forfeiture and cancellation of the lease as provided in section 31 of the Mineral Leasing Act if: (1) the lessee fails to comply with the provisions of the Mineral Leasing Act, or with the general regulations in force at the date of the lease or in force at the effective date of any readjustment of the terms and conditions of the lease under section 3451.1, or if the lessee defaults in the performance of any of the terms, convenants, and stipulations of the lease. A waiver of any particular cause of forfeiture shall not prevent the cancellation and forfeiture of the lease for any other cause of forfeiture, or for the same cause occurring at any other time.

(b) The lessee shall be given notice of any proposed cancellation and be afforded 30 days to cure the default or to submit evidence showing why the lease should not be cancelled.

(c) Any lease issued or readjusted on or after August 4, 1976, shall be terminated if the lessee does not meet diligent development requirements. Any other lease on which the lessee does not meet diligent development requirements will be subject to cancellation in whole or in part. Any lease on which the lessee does not meet either continued operation or advance royalty requirements shall be subject to cancellation in whole or in part. In deciding whether to initiate lease cancellation proceedings under the two preceding sentences, the Secretary

shall not consider adverse circumstances which arise out of: (1) normally foreseeable cost of compliance with requirements for environmental protection; (2) commonly experienced delays in delivery of supplies or equipment; or (3) inability to obtain sufficient sales.

(d) Except where surface coal mining operations were being conducted on August 3, 1977, or where substantial legal and financial commitments were made in a lease to be developed by surface coal mining operations prior to January 1, 1977, existing leases shall be subject to designation of all or part of the lands contained in the lease as unsuitable for surface coal mining. This determination shall be made either after an operator submits a mining plan or upon a petition to designate the land unsuitable. If a lease area or a portion of a lease area is determined to be unsuitable for surface coal mining or with respect to a nonproducing lease the lease is found to be incompatible with the land use plan, the Secretary may enter into negotiations with the operator for exchange of future bidding rights for coal or other minerals as described in subpart, 3425. If a lease area or portion of a lease area is determined to be unsuitable because of impacts to alluvial valley floors, the Secretary may enter into negotiations with the operator to exchange the lease for another Federal coal lease in an area acceptable for mining operations pursuant to Subpart 3426.

(e) Where exchange agreements cannot be reached on leased lands determined unsuitable for surface coal mining, the Secretary shall take necessary steps to cancel the lease.

(f) Should a lease be cancelled or relinquished for any reason, all deferred bonus payments shall be immediately payable and all rentals and royalties, including advance royalties already paid or due, will be forfeited to the United States.

§ 3452.3 Termination.

Any lease shall terminate automatically if the lessee fails to pay the rental on or before the anniversary date of the lease. However, if time for payment falls upon any day on which the proper office to receive payment is not open, payment received on the next official working day shall be deemed to be timely. The termination of the lease for failure to pay the rental must be noted on the official records of the proper office. Until such notation is made, the lands included in such lease are not subject to issuance of any other lease.

Subpart 3453 - Modifications.

§ 3453.1 Application for modification.

A lessee may obtain a modification of the lease to include coal lands or coal deposits contiguous to those embraced in that lease if the authorized officer determines that it would be in the interest of the United States to do so. In no event shall the total area added by any modification or modifications exceed one hundred sixty (160) acres or the same number of acres in the original lease, whichever is less.

The lessee shall file the application for modification in the State Office, of the Bureau of Land Management having jurisdiction over the lands involved, describing the additional lands desired, the needs and reasons for, and the advantage to the lessee of such modification.

§ 3453.2 Availability.

When the authorized officer determines that the modification is justified, that the interests of the United States are protected, that there is no competitive interest in the lands or deposits, and that the additional lands or deposits cannot be developed as part of an independent operation, the lease will be modified without competitive bidding to include such part of the land or deposits prescribed by the authorized officer.

§ 3453.3 Terms and conditions.

The terms and conditions of the original lease shall be consistent with the Act, regulations, lease terms applicable at the time of modification. Before a lease is modified, the lessee shall file a written acceptance of the conditions imposed in the modified lease and a written consent of the surety under the bond covering the original lease to the modification of the lease and to extension of the bond to cover the additional land.

Subpart 3454 - Assignments or Transfers and Subleases

§ 3454.1 Qualifications.

§ 3454.1-1 Who may assign or hold an assignment.

(a) Leases may be transferred in whole or in part to any person, association or corporation qualified to hold such leases.

(b) A minor is not qualified to hold a lease and transfers to a minor shall not be approved. However, an assignment in behalf of a minor heir or devisee of a lessee to a legal guardian or trustee may be approved.

§ 3454.1-2 Failure to qualify.

No transfer shall be approved if the transferee is not qualified under subpart 3402 to take and hold a lease, if the bond is insufficient, or if the request was not accompanied by a filing fee.

§ 3454.1-3 Number of copies required.

A single signed copy of the qualifications required under subpart 3402 is sufficient.

§ 3454.1-4 Sole party in interest.

The sole party in interest shall comply with § 3402.1-1(d).

§ 3454.1-5 Attorney-in-fact.

The attorney-in-fact shall comply with § 3402.2-2(f).

§ 3454.1-6 Heirs and devisees.

Appropriate showing as required under § 3402.2-3 shall be furnished before the heirs or devisees of a deceased holder of a lease, operating agreement, or royalty interest in a lease can be recognized by the Secretary as the new holder of a lease, agreement, or interest.

§ 3454.2 Requirements.

§ 3454.2-2 Forms and statements.

(a) Assignments or transfers of any record title interest shall be filed in triplicate.

(b) There is no specific form need be used for assignment, transfers or requests for approval. The application shall contain evidence of the assignee's or transferee's qualifications. This evidence shall consist of the same showing as is required of a lease or permit applicant as set forth in qualifications Subpart 3402.

(c) A separate instrument of assignment or transfer must be filed for each lease when transfers involve record titles. When transfers to the same person, association, or corporation involving more than one lease are filed at the same time, one request for approval and one showing as to the qualifications of the assignee or transferee will be sufficient.

(d) A single signed copy of all other instruments of transfer is sufficient. Exception: Collateral assignments and other mortgage documents will not be accepted for filing.

approval, the transferee, including any sublessee, and the transferee's surety shall be responsible for the performance of all lease obligations notwithstanding any terms in the transfer to the contrary.

§ 3454.2-4 Lease account status.

The lease account shall be in good standing before a transfer may be approved.

§ 3454.2-5 Description of lands.

The description of the lands involved in the instrument of transfer shall match the description of lands in the lease. The approval of transfer of only a part of the lands described in a lease shall create a new lease.

§ 3454.3 Approval.

§ 3454.3-1 Application.

Applications for transfers of leases, whether by direct assignments, working agreements, transfer of royalty interests, subleases or otherwise, shall be filed for approval within 90 days from final execution. Transfers shall include evidence of the qualifications of the transferee, consisting of the same showing required of a lease applicant by Subpart 3402.

§ 3454.3-2 Effective date.

A transfer shall take effect the first day of the month following its final approval by the Bureau of Land Management, or if the transferee requests, the first day of the month of the approval.

§ 3454.3-3 Extensions.

The approval of any transfer shall not alter the readjustment periods of the lease.

# PART 3460 - LICENSE TO MINE COAL

## Subpart 3460 - License to Mine Coal

Sec.

3460.0-1 Purpose.

3460.0-3 Authority.

3460.1 Terms.

3460.1-1 Forms.

3460.1-2 Area and duration of license.

3460.1-3 Renewal.

3460.2 Qualifications

3460.2-1 Private.

3460.2-2 Local relief agencies.

3460.2-3 Municipalities.

AUTHORITY: 30 U.S.C. 181 et seq.

PART 3460 - LICENSE TO MINE COAL

Subpart 3460 - License to Mine Coal

§ 3460.0-1 Purposes.

Coal licenses may be issued without the payment of any rent or royalty for a period of two years to individuals and associations of individuals to mine and take coal for their own local domestic need for fuel. Licenses may be issued to municipalities for the nonprofit mining and disposal of coal to their residents for household use. Under such a license, a municipality may not mine coal either for its own or for nonhousehold use such as for factories, stores, other business establishments and heating and lighting plants.

Ss 3460.0-3 Authorities.

Sections 2 to 8, inclusive, of the Act of February 25, 1920, as amended (30 U.S.C. 201, 202-208), authorize the Secretary of the Interior to issue limited licenses or permits to prospect for, mine, and take for use, coal from public lands.

§ 3460.1 Terms.

§ 3460.1-1 Forms.

(a) Four copies of the application for a limited license to mine coal for domestic needs shall be filed on a form approved by the Director or a substantial equivalent of the form in the appropriate State Office

of the Bureau of Land Management. The original application or any renewal application shall be accompanied by a $10 filing fee.

(b) No filing fee is required of relief agencies.

(c) A municipality shall file the information required under section 3402.0-4(b).

§ 3460.1-2 Area and duration of license.

(a) Licenses for an individual or association, in the absence of unusual conditions or necessity, shall be limited to a legal subdivision of 40 acres or less and may be revoked at any time. Such licenses shall expire by limitation at the end of two years from the date of issuance, unless the application is renewed before its expiration date.

(b) (1) The authorized officer may authorize a recognized established relief agency of any State, upon its request, to take government-owned coal deposits within the State and provide it to localities where it is needed to supply families on the rolls of such agency who require coal for household use but are unable to pay for that coal.

(2) Tracts shall be selected in areas determined acceptable for coal leasing and at points convenient to supply the families in a locality. Each family shall be restricted to the amount of coal actually needed for its use, not exceed 20 tons annually.

(3) Coal may be taken from such tracts only by those given written authority by the relief agency. All mining shall be done pursuant to such authorization. All Federal and State laws and regulations for the safety of miners, prevention of fires and of waste, etc., shall be observed. The relief agency shall see that the premises are left in a safe condition for future mining operations.

(c) Licenses to municipalities are limited as follows: The area is not to exceed 320 acres for a municipality of less that 100,000 population, not to exceed 1,280 acres for a municipality between 100,000 and 150,000 population, and not to exceed 2,560 acres for a municipality of 150,000 population or more. Licenses to municipalities shall expire by limitation at the end of four (4) years from date of issuance, unless renewed. Every licensee shall provide an annual report to the Bureau of Land Management describing all operations conducted under such license.

# APPENDIX B

# REFERENCES AND BIBLIOGRAPHIES

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# APPENDIX C

## STATE RECREATION FACILITIES

TABLE C-1. STATE RECREATION FACILITIES IN THE APPALACHIAN REGION

| State | STATE PARKS | | | STATE FORESTS | | | STATE NATURAL AREAS | | | OTHER** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Alabama | 8 | 29,063 | 955,900 | - | - | - | - | - | - | - | - | - |
| Georgia | 3 | 2,153 | 343,600 | - | - | - | - | - | - | - | - | - |
| Kentucky | 13 | 24,514 | 10,703,000 | - | - | - | - | - | - | 1 | 12 | 90,000 |
| Maryland* | | | | | | | | | | | | |
| Ohio | 22 | 72,199 | 14,849,800 | - | - | - | - | - | - | - | - | - |
| Pennsylvania | 56 | 188,595 | 18,587,900 | - | - | - | - | - | - | 7 | 162 | 180,000 |
| Tennessee | 8 | 46,652 | 3,344,100 | - | - | - | 1 | 11,329 | * | - | - | - |
| Virginia | 2 | 3,067 | 405,100 | - | - | - | - | - | - | 1 | * | 15,000 |
| West Virginia | 26 | 53,848 | 5,852,600 | 10 | 79,636 | 1,460,400 | - | - | - | - | - | - |
| Subtotal | 138 | 420,091 | 55,042,000 | 10 | 79,636 | 1,460,400 | 1 | 11,329 | * | 9 | 174 | 285,000 |

*Data not available.

**State museums, shrines and forest picnic areas.

NOTE: The data in this table and subsequent state recreation facility tables were derived from pamphlets and brochures issued by the recreation departments of the various states.

TABLE C-2. STATE RECREATION FACILITIES IN THE EASTERN INTERIOR REGION

| State | STATE PARKS | | | STATE FORESTS AND PRESERVES | | | STATE FISH AND WILDLIFE AREAS | | | OTHER* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Illinois | 45 | 59,200 | 12,478,500 | 3 | 10,880 | 47,400 | 33 | 59,567 | 3,224,500 | 30 | 3,374 | 2,109,900 |
| Indiana | 6 | 19,042 | 1,931,764 | 5 | 22,075 | ** | 3 | 20,034 | ** | 2 | 7,318 | 450,261 |
| Iowa | 2 | 321 | 151,000 | 1 | ** | ** | - | - | - | - | - | - |
| Kentucky | 5 | 2,147 | 3,307,000 | - | - | - | - | - | - | 1 | 16 | 81,000 |
| Total | 58 | 80,710 | 17,868,264 | 9 | 32,955*** | 47,400*** | 36 | 79,601 | 3,224,500*** | 33 | 10,708 | 2,641,161 |

*Includes state shrine, memorials, historical sites, recreation areas.
**Data not available.
***Excludes some states.

TABLE C-3. STATE RECREATION FACILITIES IN THE WESTERN INTERIOR REGION

| State | STATE PARKS | | | STATE FORESTS AND PRESERVES | | | STATE RECREATIONAL AREAS | | | OTHER* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Arkansas | 3 | 4,202 | 957,600 | - | - | - | - | - | - | - | - | - |
| Iowa | 34 | 40,108 | 8,468,400 | 10 | 18,166 | 33,200 | - | - | - | - | - | - |
| Kansas | - | - | - | 16 | 132,938 | ** | 10 | 4,166 | ** | 4 | 147 | ** |
| Missouri | 16 | 24,417 | 2,572,000 | - | - | - | - | - | - | 11 | 1,747 | 12,200 |
| Nebraska | - | - | - | - | - | - | 17 | 8,424 | 1,577,000 | - | - | - |
| Oklahoma | 13 | 23,900 | 3,992,700 | - | - | - | 13 | 2,133 | 1,976,900 | 5 | 503 | 310,700 |
| Total | 66 | 92,627 | 15,990,700 | 26 | 151,104 | 33,200*** | 40 | 14,723 | 3,553,900*** | 20 | 2,397 | 322,900*** |

*Includes museums, monuments and memorials, historical sites, fishing areas, public domains.
**Data not available.
***Excludes some states.

TABLE C-4. RECREATION FACILITIES IN THE TEXAS GULF REGION

| State | STATE PARKS | | | STATE WILDLIFE MGMT. AREAS | | | STATE RECREATION AREAS | | | STATE HISTORICAL AREAS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Arkansas | – | – | – | – | – | – | – | – | – | – | – | – |
| Louisiana | 3 | 86 | 144,300 | 4 | 55,936 | * | – | – | – | – | – | – |
| Texas | 8 | 8,738 | 1,713,300 | 3 | 17,141 | * | 4 | 4,148 | 812,400 | 11 | 845 | 650,000 |
| Total | 11 | 8,824 | 1,857,600 | 7 | 73,077 | * | 4 | 4,148 | 812,400 | 11 | 845 | 650,000 |

*Data not available.

TABLE C-5. STATE RECREATION FACILITIES IN THE POWDER RIVER REGION

| State | STATE PARKS | | | STATE HISTORICAL SITES | | | STATE RECREATION AND FISHING AREAS | | | STATE WILDLIFE MANAGEMENT AREAS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Montana | - | - | - | 1 | 22 | * | 7 | 189 | * | 1 | 1,117 | * |
| Wyoming | 1 | 5,000 | * | 10 | * | * | - | - | - | - | - | - |
| Total | 1 | 5,000 | * | 11 | * | * | 7 | 189 | * | 1 | 1,117 | * |

*Data not available.

TABLE C-6. STATE RECREATION FACILITIES IN THE GREEN RIVER REGION

| State | STATE PARK | | | STATE RECREATION AREAS | | | STATE BEACH | | | STATE HISTORICAL SITES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Colorado | 1 | 72,130 | 88,200 | 1 | 2,773 | 178,200 | - | - | - | - | - | - |
| Idaho | - | - | - | - | - | - | - | - | - | - | - | - |
| Utah | - | - | - | 2 | 593 | 406,300 | 1 | 693 | 20,100 | - | - | - |
| Wyoming | 2 | * | * | - | - | - | - | - | - | 12 | * | * |
| Total | 3 | 72,130** | 88,200** | 3 | 3,366 | 584,500 | 1 | 693 | 20,100 | 12 | * | * |

*Data not available.
**Excludes some states.

TABLE C-7. STATE RECREATION FACILITIES IN THE FORT UNION REGION

| State | STATE PARKS | | | RECREATION AREAS | | | OTHER* | | | WILDLIFE MANAGEMENT AREA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Montana | 2 | 4,948 | ** | 11 | 444 | ** | - | - | - | - | - | - |
| North Dakota | 6 | 8,807 | 533,400 | - | - | - | 4 | 1,839 | 6,000 | - | - | - |
| South Dakota | 1 | 1,845 | 104,000 | 4 | 2,459 | 112,000 | - | - | - | - | - | - |
| Total | 9 | 15,600 | 637,400*** | 15 | 2,903 | 112,000*** | 4 | 1,839 | 6,000 | 2 | 1,410 | ** |

*Includes state campground, undeveloped areas, scenic river.
**Data not available.
***Excluding Montana.

TABLE C-8. STATE RECREATION FACILITIES IN THE SAN JUAN RIVER REGION

| State | STATE PARKS | | | STATE RESERVES | | | STATE HISTORICAL MONUMENTS | | | STATE RECREATION AREAS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Arizona | 1 | 160 | 136,900 | - | - | - | - | - | - | - | - | - |
| Colorado | - | - | - | - | - | - | - | - | - | 2 | 5,853 | 237,800 |
| New Mexico | 5 | 51,343 | 428,900 | - | - | - | - | - | - | - | - | - |
| Utah | - | - | - | 2 | 626 | 42,300 | 2 | 17 | 62,900 | - | - | - |
| Total | 6 | 51,503 | 565,800 | 2 | 626 | 42,300 | 2 | 17 | 62,900 | 2 | 5,853 | 237,800 |

TABLE C-9. STATE RECREATION FACILITIES IN THE UINTA-SOUTHWESTERN UTAH REGION

| State | STATE PARKS | | | STATE RECREATION AREAS | | | STATE RESERVES | | | OTHER* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Colorado | - | - | - | 7 | 9,472 | 713,400 | - | - | - | - | - | - |
| Utah | 2 | 10,316 | 249,700 | 6 | 3,269 | 428,200 | 4 | 9,967 | 104,800 | 5 | 736 | 224,000 |
| Total | 2 | 10,316 | 249,700 | 13 | 12,741 | 1,141,600 | 4 | 9,967 | 104,800 | 5 | 736 | 224,000 |

*Includes state historical monuments, state beaches, and state museums.

TABLE C-10. STATE RECREATION FACILITIES IN THE DENVER-RATON MESA REGION

| State | STATE PARKS | | | STATE RECREATION AREAS | | |
|---|---|---|---|---|---|---|
| | No. | Acreage | Annual Attendance | No. | Acreage | Annual Attendance |
| Colorado | 1 | 2,463 | 66,000 | 8 | 20,183 | 2,683,400 |
| New Mexico | - | - | - | - | - | - |
| Total | 1 | 2,463 | 66,000 | 8 | 20,183 | 2,683,400 |

TABLE C-11. PROJECTED INCREASES IN RECREATION ACREAGE UNDER THE PREFERRED ALTERNATIVE

| | 1985[a] | | | | | | 1990[b] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FEDERAL | | | STATE | | | FEDERAL | | | STATE | | |
| | High | Medium | Low | High | Medium | Low | High | Medium | Low | High | Medium | Low |
| Northern Appalachia | 875 | 776 | 714 | 7,041 | 6,242 | 5,750 | 1,792 | 600 | No change | 14,422 | 4,828 | No change |
| Central Appalachia | 134 | 439 | 369 | 1,962 | 6,407 | 5,395 | 1,059 | 379 | 115 | 15,465 | 5,533 | 1,686 |
| Southern Appalachia | 2,352 | 1,747 | 810 | 2,532 | 1,881 | 873 | 2,131 | 618 | No change | 2,395 | 666 | No change |
| Eastern Interior | 2,084 | 2,738 | 2,555 | 5,589 | 7,343 | 6,853 | 5,073 | 3,476 | 2,282 | 13,605 | 9,322 | 6,119 |
| Western Interior | 1,452 | 1,250 | 885 | 4,878 | 4,200 | 2,973 | 2,283 | 1,895 | 231 | 7,669 | 6,365 | 783 |
| Texas Gulf | c | c | c | 5,387 | 6,343 | 4,214 | c | c | c | 11,053 | 7,933 | 1,929 |
| Powder River | 262,413 | 171,695 | 126,552 | 4,585 | 3,000 | 2,211 | 362,009 | 246,247 | 40,849 | 6,326 | 4,303 | 714 |
| Green River - Ham's Fork | 45,107 | 29,542 | 12,897 | 20,358 | 13,333 | 5,820 | 28,596 | 21,878 | 17,252 | 12,906 | 9,874 | 7,786 |
| Fort Union | 31,232 | 15,114 | 13,584 | 2,976 | 1,440 | 1,294 | 25,959 | 29,863 | 6,050 | 2,473 | 2,845 | 576 |
| San Juan River | 22,882 | 9,888 | 4,725 | 3,932 | 1,699 | 812 | 42,726 | 12,960 | 14,444 | 7,342 | 2,227 | 2,482 |
| Uinta - S.W. Utah | 61,225 | 39,645 | 19,728 | 5,469 | 3,541 | 1,762 | 39,305 | 25,132 | 21,958 | 3,511 | 2,245 | 1,961 |
| Denver - Raton Mesa | 69 | 50 | 30 | 451 | 331 | 199 | 111 | 108 | 46 | 729 | 709 | 301 |

[a]Federal and State increases in recreation acreage over 1975 levels required to maintain 1975 population-recreation acreage ratio. Figures are based on population increases due to coal production only.

[b]Additional increases over 1985 levels to maintain 1975 population-recreation acreage ratio.

[c]No Federal recreation land in 1975.

TABLE c-12. PROJECTED INCREASES IN RECREATION ACREAGE UNDER THE NO NEW LEASING ALTERNATIVE

| | 1985[a] | | | | | | 1990[b] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FEDERAL | | | STATE | | | FEDERAL | | | STATE | | |
| | High | Medium | Low | High | Medium | Low | High | Medium | Low | High | Medium | Low |
| Northern Appalachia | 879 | 776 | 714 | 7,072 | 6,242 | 5,750 | 458 | 592 | -11 | 3,690 | 4,766 | -92 |
| Central Appalachia | 152 | 447 | 370 | 2,222 | 6,530 | 5,410 | 673 | 407 | 115 | 9,825 | 5,947 | 1,686 |
| Southern Appalachia | 2,412 | 1,794 | 764 | 2,598 | 1,932 | 822 | 675 | 600 | 33 | 726 | 646 | 35 |
| Eastern Interior | 2,282 | 2,677 | 2,555 | 6,119 | 7,180 | 6,853 | 3,240 | 3,780 | 2,297 | 8,689 | 10,137 | 6,160 |
| Western Interior | 1,398 | 1,235 | 885 | 4,695 | 4,148 | 2,974 | 1,779 | 1,918 | 225 | 5,973 | 6,443 | 756 |
| Texas Gulf | c | c | c | 5,674 | 6,230 | 4,214 | c | c | c | 8,698 | 6,654 | 1,972 |
| Powder River | 238,850 | 170,612 | 126,588 | 4,174 | 2,981 | 2,212 | 90,791 | 136,259 | 40,307 | 1,586 | 2,381 | 704 |
| Green River - Ham's Fork | 33,813 | 27,398 | 12,914 | 15,260 | 12,365 | 5,828 | 15,395 | 12,677 | 15,294 | 6,948 | 5,722 | 6,902 |
| Fort Union | 30,776 | 15,068 | 13,607 | 2,932 | 1,436 | 1,296 | 30,753 | 33,972 | 5,936 | 2,930 | 3,237 | 565 |
| San Juan River | 22,510 | 9,720 | 4,725 | 3,868 | 1,670 | 812 | 11,812 | 18,056 | 13,938 | 2,030 | 3,103 | 2,395 |
| Uinta - S.W. Utah | 60,091 | 38,814 | 19,728 | 5,368 | 3,467 | 1,762 | 32,956 | 31,331 | 21,013 | 2,944 | 2,799 | 1,877 |
| Denver - Raton Mesa | 67 | 50 | 30 | 439 | 326 | 199 | 94 | 107 | 45 | 618 | 700 | 292 |

[a] Federal and State increases in recreation acreage over 1975 levels required to maintain 1975 population-recreation acreage ratio. Figures are based on population increases due to coal production only.

[b] Additional increases over 1985 levels to maintain 1975 population-recreation acreage ratio.

[c] No Federal recreation land in 1975.

TABLE C-13. PROJECTED INCREASES IN RECREATION ACREAGE UNDER THE PREFERENCE RIGHT LEASE ALTERNATIVE

| | 1985[a] | | 1990[b] | |
|---|---|---|---|---|
| | Federal | State | Federal | State |
| Northern Appalachia | 756 | 6,242 | 592 | 4,766 |
| Central Appalachia | 447 | 6,530 | 418 | 6,100 |
| Southern Appalachia | 1,761 | 1,897 | 679 | 731 |
| Eastern Interior | 2,670 | 7,159 | 3,407 | 9,138 |
| Western Interior | 1,227 | 4,121 | 1,864 | 6,260 |
| Texas Gulf | c | 6,221 | c | 8,585 |
| Powder River | 170,756 | 2,984 | 192,083 | 3,357 |
| Green River - Ham's Fork | 28,326 | 12,784 | 13,555 | 6,118 |
| Fort Union | 15,091 | 1,438 | 32,443 | 3,091 |
| San Juan River | 9,686 | 1,664 | 16,098 | 2,766 |
| Uinta - S.W. Utah | 39,154 | 3,497 | 26,266 | 2,346 |
| Denver - Raton Mesa | 50 | 328 | 108 | 709 |

[a]Federal and State increases in recreation acreage over 1975 levels required to maintain 1975 population-recreation acreage ratio. Figures are based on population increases due to coal production only.

[b]Additional increases over 1985 levels to maintain 1975 population-recreation acreage ratio.

[c]No Federal recreation land in 1975.

TABLE C-14. PROJECTED INCREASES IN RECREATION ACREAGE UNDER THE SHORT-TERM LEASING ALTERNATIVE

| | 1985[a] | | 1990[b] | |
|---|---|---|---|---|
| | Federal | State | Federal | State |
| Northern Appalachia | 776 | 6,242 | 592 | 4,766 |
| Central Appalachia | 441 | 6,438 | 405 | 5,917 |
| Southern Appalachia | 1,794 | 1,932 | 609 | 656 |
| Eastern Interior | 2,692 | 7,220 | 3,674 | 9,852 |
| Western Interior | 1,243 | 4,174 | 1,911 | 6,417 |
| Texas Gulf | c | 6,256 | c | 8,559 |
| Powder River | 171,045 | 2,989 | 148,600 | 2,597 |
| Green River - Ham's Fork | 27,989 | 12,632 | 14,720 | 6,643 |
| Fort Union | 15,091 | 1,438 | 33,927 | 3,232 |
| San Juan River | 9,686 | 1,664 | 17,718 | 3,045 |
| Uinta - S.W. Utah | 39,040 | 3,487 | 31,028 | 2,772 |
| Denver - Raton Mesa | 50 | 328 | 107 | 702 |

[a]Federal and State increases in recreation acreage over 1975 levels required to maintain 1975 population-recreation acreage ratio. Figures are based on population increases due to coal production only.

[b]Additional increases over 1985 levels to maintain 1975 population-recreation acreage ratio.

[c]No Federal recreation land in 1975.

TABLE C15. PROJECTED INCREASES IN RECREATION ACREAGE UNDER THE INDUSTRY NEEDS ALTERNATIVE

| | 1985[a] | | 1990[b] | |
|---|---|---|---|---|
| | Federal | State | Federal | State |
| Northern Appalachia | 772 | 6,211 | 585 | 4,705 |
| Central Appalachia | 357 | 5,211 | 449 | 6,560 |
| Southern Appalachia | 1,949 | 2,099 | 642 | 691 |
| Eastern Interior | 2,502 | 6,711 | 2,966 | 7,955 |
| Western Interior | 1,243 | 4,174 | 1,918 | 6,443 |
| Texas Gulf | c | 5,961 | c | 7,577 |
| Powder River | 190,495 | 3,329 | 279,518 | 4,885 |
| Green River - Ham's Fork | 41,055 | 18,529 | 21,017 | 9,485 |
| Fort Union | 17,580 | 1,675 | 33,310 | 3,174 |
| San Juan River | 12,183 | 2,094 | 16,098 | 2,766 |
| Uinta - S.W. Utah | 46,032 | 4,112 | 31,255 | 2,792 |
| Denver - Raton Mesa | 54 | 351 | 102 | 666 |

[a] Federal and State increases in recreation acreage over 1975 levels required to maintain 1975 population-recreation acreage ratio. Figures are based on population increase due to coal production only.

[b] Additional increases over 1985 levels to maintain 1975 population-recreation acreage ratio.

[c] No Federal recreation land in 1975.

TABLE C-16. PROJECTED INCREASES IN RECREATION ACREAGE UNDER STATE DETERMINATION OF LEASING ALTERNATIVES

| | 1985[a] | | 1990[b] | |
|---|---|---|---|---|
| | Federal | State | Federal | State |
| Northern Appalachia | 772 | 6,211 | 649 | 5,227 |
| Central Appalachia | 486 | 7,097 | 459 | 6,698 |
| Southern Appalachia | 1,621 | 1,745 | 192 | 207 |
| Eastern Interior | 2,791 | 7,486 | 4,754 | 12,748 |
| Western Interior | 1,592 | 5,347 | 1,382 | 4,643 |
| Texas Gulf | c | 6,682 | c | 7,855 |
| Powder River | 152,966 | 2,673 | 120,778 | 2,111 |
| Green River - Ham's Fork | 21,591 | 9,744 | 5,115 | 2,308 |
| Fort Union | 17,580 | 1,675 | 32,169 | 3,065 |
| San Juan River | 12,993 | 2,233 | 16,739 | 2,877 |
| Uinta - S.W. Utah | 39,078 | 3,491 | 21,542 | 1,924 |
| Denver - Raton Mesa | 52 | 340 | 99 | 648 |

[a]Federal and State increases in recreation acreage over 1975 levels required to maintain 1975 population-recreation acreage ratio. Figures are based on population increase due to coal production only.

[c]No Federal recreation land in 1975.

TABLE C-17. PROJECTED INCREASES IN RECREATION ACREAGE UNDER THE DOE PRODUCTION GOALS ALTERNATIVE

| | 1985[a] | | 1990[b] | |
|---|---|---|---|---|
| | Federal | State | Federal | State |
| Northern Appalachia | 650 | 5,227 | 443 | 3,567 |
| Central Appalachia | 120 | 1,747 | 535 | 7,817 |
| Southern Appalachia | 1,541 | 1,660 | 295 | 318 |
| Eastern Interior | 2,556 | 6,854 | 3,613 | 9,688 |
| Western Interior | 1,320 | 4,434 | 1,250 | 4,200 |
| Texas Gulf | c | 6,074 | c | 7,881 |
| Powder River | 167,401 | 2,925 | 234,447 | 4,097 |
| Green River - Ham's Fork | 41,797 | 18,864 | 18,653 | 8,419 |
| Fort Union | 10,822 | 1,031 | 28,059 | 2,673 |
| San Juan River | 8,774 | 1,508 | 35,841 | 6,159 |
| Uinta - S.W. Utah | 35,186 | 3,143 | 15,684 | 1,401 |
| Denver - Raton Mesa | 53 | 344 | 55 | 358 |

[a]Federal and State increases in recreation acreage over 1975 levels required to maintain 1975 population-recreation acreage ratio. Figures are based on population increases due to coal production only.

[b]Additional increases over 1985 levels to maintain 1975 population-recreation acreage ratio.

[c]No Federal recreation land in 1975.

# APPENDIX E

## COAL TECHNOLOGY BACKGROUND INFORMATION

## E. COAL TECHNOLOGY BACKGROUND INFORMATION

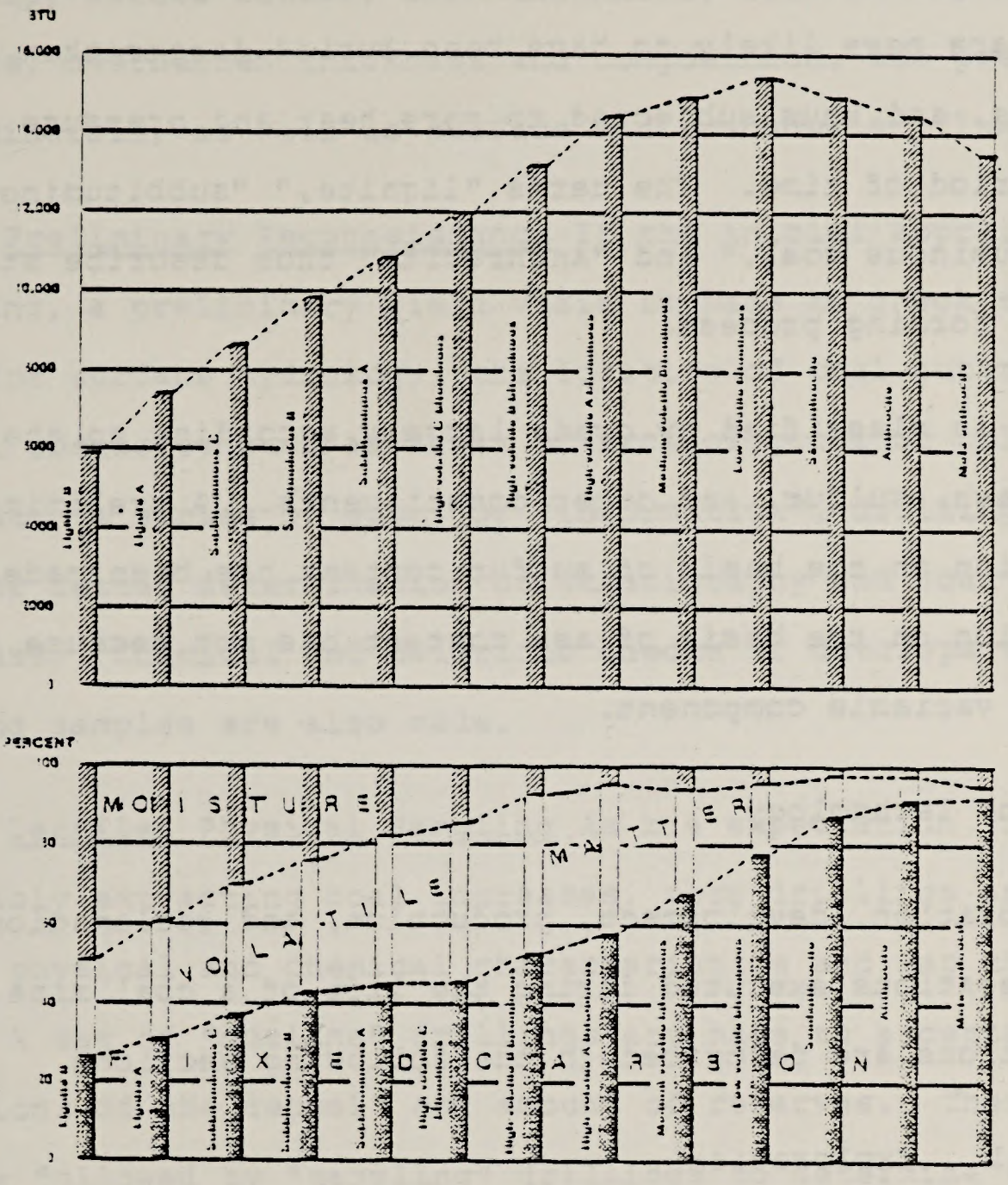
### E.1 Important Coal Characteristics

Coal is defined as a readily combustible rock containing more than 50 percent by weight and more than 70 percent by volume of carbonaceous materials including inherent moisture formed from compaction and induration of variously altered plant remains similar to those in peat (U.S. Department of Interior, 1975d). Character and quality (as defined by rank and grade), are the factors that determine coals's relative value and usefulness. These factors are controlled principally by conditions during formation and the depth of burial of the coal.

Coal is composed of plants and plant fragments that accumulated in ancient fresh and brackish water marshes and swamps. As this plant material increased in quantity year after year, the lower layers were compacted under the weight of the upper layers, and, in time, became peat, the initial stage in the formation of coal. Later, the swamps were covered by the sea or by meandering rivers that flooded, burying the layers of begation under accumulations of clay, sand, and silt. Most of the large coal deposits of Pennsylvanian age that are mined extensively in the eastern and central United States were developed from peat beds formed near sea level -- some in estuaries or coastal lagoons, others on large deltas or coalescing deltas, and others on broad, low-lying coastal plains. Many of the younger large coal deposits of Cretaceous and Tertiary age found in the West were not deposited near the sea. Instead, they formed in intercontinental basins characterized by broad interconnected swamps, lakes, and flood

plains of large river systems. Some of these river systems may have formed on the nearly flat tidal plains exposed when the land was uplifted and ancient seas migrated out. Others were formed in nonmarine environments millions of years after the land was last covered by the sea. Centuries or millennia were required to accumulate the nearly pure vegetal piles necessary to form thick beds of coal. The transgressing seas or migrating river channels ultimately covered the peat-forming swamps and terminated plant growth. The eroding land-masses continued to supply sand, silt, and mud and this material was deposited in layers over the submerged peat swamps. In time, depending on the rate of sedimentation, the depth of the transgressive area in marginal marine areas, and the rate of subsidence or sinking of the basins, this sedimentary material built-up new flood plains, swamps, deltas, lagoons, and coastal plains condutive to the development of new younger peat-forming swamps. The weight of the overlying sedimentary cover, heat produced by depth of burial, and pressures and heat accompanying structural deformation all contribute to the progressive compaction and devolatilization of peat to form the various ranks of coal.

Coal is classified according to a particular property such as degree of metamorphism or "coalification" (rank), constituent plant materials (type), or degree of impurity (grade). The rank of a particular coal is established according to the percentage of fixed carbon and the peat content, calculated on a mineral-matter-free basis. As shown in Figure , the percentage of fixed carbon and the heat (BTU) content increases from low rank lignite to higher rank bituminous coal as the percentages of volatile matter and moisture decrease.




Source: Averitt, 1975.

FIGURE
COAL CLASSIFICATION BY RANK (44)

On a regional scale, the required amount of heat to form coal is produced by the normal geothermal gradient accompanying depth of burial (approximately 25 °C per kilometer). This, in turn, is related to the geological age of the beds, because the older beds are more likely to have been buried deeper than the younger beds, and thus subjected to more heat and pressure over a longer period of time. The terms "lignite," "subbituminous coal," "bituminous coal," and "anthracite" thus describe stages in the coal forming process.

Coal is classified by grade largely according to the content of ash, sulfur, and other constituents. A preliminary classification on the basis of sulfur content has been made, but classification on the basis of ash content has not because ash is a highly variable component.



Exploration, development, production, and reclamation are the four operations executed during the life of a coal mine. These operations are described in the following sections

### E.2.1 Exploration

Generally exploration aims at locating the presence of economic deposits and establishing their nature, shape and grade. There are three broad phases which comprise mineral exploration -- initial appraisal, preliminary reconnaissance, and detailed physical sampling (Bissell, et al., 1975).

Initial Appraisal This step involves literature search and the review of maps (geological, geographical, hydrological, etc.) to ascertain factors relating to surface and mineral ownership, access routes, seam thickness, seam pitch, surface contours, overburden thickness and composition, the presence of other minerals, as well as surface and groundwater flows.

Preliminary Reconnaissance If the initial appraisal looks promising, a preliminary field visit is made to check the likely sites for surface hydrology, the location of coal outcrops, and unusual obstacles such as areas of archeological or cultural interest. A series of spot, or "information", drillings may be made for better determination of stratigraphy and coal seam thickness. Chemical and calorific checks of outcrops and/or drilling samples are also made.

Detailed Physical Sampling As the expectation for profitably extracting coal increases, more drillings are made to verify physical and chemical characteristics and map the coal seam. A set of "outline" drillings are made to ascertain the dimensions of the deposit and amount of reserves. These may then be followed by "sampling" drillings to determine the necessary parameters with enough certainty that reliable economic appraisals are possible. In general, coal deposits require less drilling than other minerals because coal is fairly consistent in thickness and quality and wider spacing can be tolerated between exploratory holes. In some instances, drilling on 1/4 mile centers is satisfactory; this is unique in mineral extraction programs when 200-foot centers are usually required. Besides the mineralogical, chemical and physical

testing of drill core samples and outcrop cuttings, there are several types of downhole or bore hole, tests which can be made with instruments lowered into the drill hole. These experiments involve devices making seismic, gravimetric, magnetic, and electrical resistance readings of the different underground strata.

Exploratory drilling is generally done with truck-mounted rotary rigs, and the samples taken with such rigs can be either cuttings or core, or both. Additional equipment used by an exploration crew may include water trucks, personnel carriers, a hole-logging equipment truck, and a dozer or grader to assist in obtaining access to the exploration area and drill site.

E.2.2 Leasing

Development, the operation preparatory to production, begins after an economic coal deposit has been found. Actual development cannot begin until all necessary arrangements have been made with Federal, State, and local governments as well as private owners that may be involved. Such arrangements include obtaining a lease; providing access to the mine property for roadways, railroad, utilities; and bonding and obtaining the permits and licenses required by Federal, state, and local authorities. A usual requirement is that an approved mining and reclamation plan before a permit is granted. Bond is posted to insure payment of rents and royalties and restoration of the land as mining progresses.

Planning, the first stage of development, includes all details of how the development work is to be accomplished, the method and equipment to be used for mining, provisions for restoration of the land plans for and prevention of air and water pollution.

After planning, the development of a mine includes construction of roads to and on the mine property, utility lines, and the mine plant. Depending upon the amount of coal produced annually and where it is to be used, construction of a railroad spur may be required. For coal that contains excessive impurities, a washing plant could be constructed as part of the mine plant. Otherwise, the mine plant consists of a coal storage and a offices, shops and laboratories equipment storaage buildings, and a waste disposal area. If the coal is to be mined by underground methods, the mine plant is constructed near the main portal. For coal mined by surface methods, the mine plant would be located off the outcrop if possible.

Access to coal deposits at an underground operation is provided by either drifts, slopes, or shafts (Figure ). The coalbed is developed for further operations by driving entries. Although terminology varies, the following system of entries is universal in the industry. Main entries are extensions of the access openings and often run several miles in one direction. Three of more parallel entries, 12 to 22 ft. wide and 40 to 100 ft. between centers, are driven in a given direction and connected at intervals by crosscuts to provide proper air circulation. These are the major routes of underground transport and access and serve for the life of the

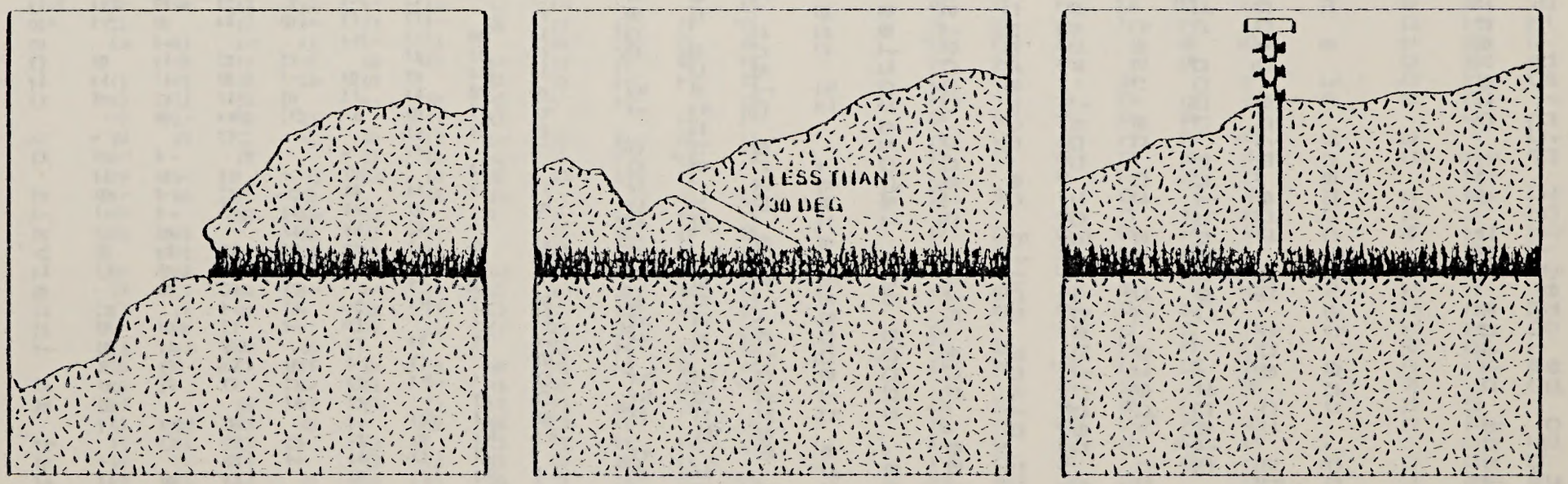



FIGURE
THE THREE TYPES OF ACCESS USED IN UNDERGROUND COAL MINES

mine (U.S. DOI, 1975d) Panel entries are driven from the main entries, resulting in a subdivision of the coalbed into blocks or panels having dimensions that may be as much as 1 by 1/2 mile. Panel entries serve as routes from main entries to the working places and for air circulation. Although coal is removed during the driving of both the main and panel entires, it is with completion of the panel entries that the production cycle begins.

Access to coal deposits at a surface operation involves the use of large equipment such as bucket-wheel excavators, draglines and shocks to remove overburden from the coal so extraction can begin. As mining progresses, development mainly consists of extcuding hard roadsand power lines, and constructing new roads for access to the coal deposit.

E.2.3 Production

This section adresses the primary operations of extracting the coal from a deposit and preparing it (cleaning and purifying it) for shipment and use.

- Extraction. There are two major methods of extracting coal: Underground mining methods or surface mining methods. Associated with each method there are a number of alternatives. In general, underground mining methods are employed when the coalbed averages about 120 or more feet below the surface; at depths beyond 1,000 feet underground mine development costs tend to be excessive. Surface mining methods are employed when the depth of

overburden averages less than about 120 feet (Bureau of Mines, 1975).

- Underground Mining In underground mining after the initial development has gained accesss to the coalbed, one of three methods i.e., room-and-pillar, longwall, and shortwall, are commonly used to extract the coal.

- Room-and-pillar mining has been used in the United States longer than any other underground method. Mining is accomplished by driving entries off the panel entries. As mining advances, rooms are excavated in the coal seam, and the strata above supported by pillars of coal left in place. Then after a block panel, or section has been mined, part of the coal in the pillars can be recovered as a retreat is made toward a main entry (Figure ). Until about 1950 most of the coal produced from underground mines was by the conventional technique. Since then, conventional mining gradually has been replaced by more mechanized, continuous mining. Conventional mining requires driving a number of entries so that each operational phase i.e., undercutting, drilling, placing explosives, blasting, loading the shot coal, and roof bolting, can be done simultaneously without one phase of the operation interferring with another. Continuous mining is performed by electric-powered machines that either bore, dig, or rip the coal from the working face.

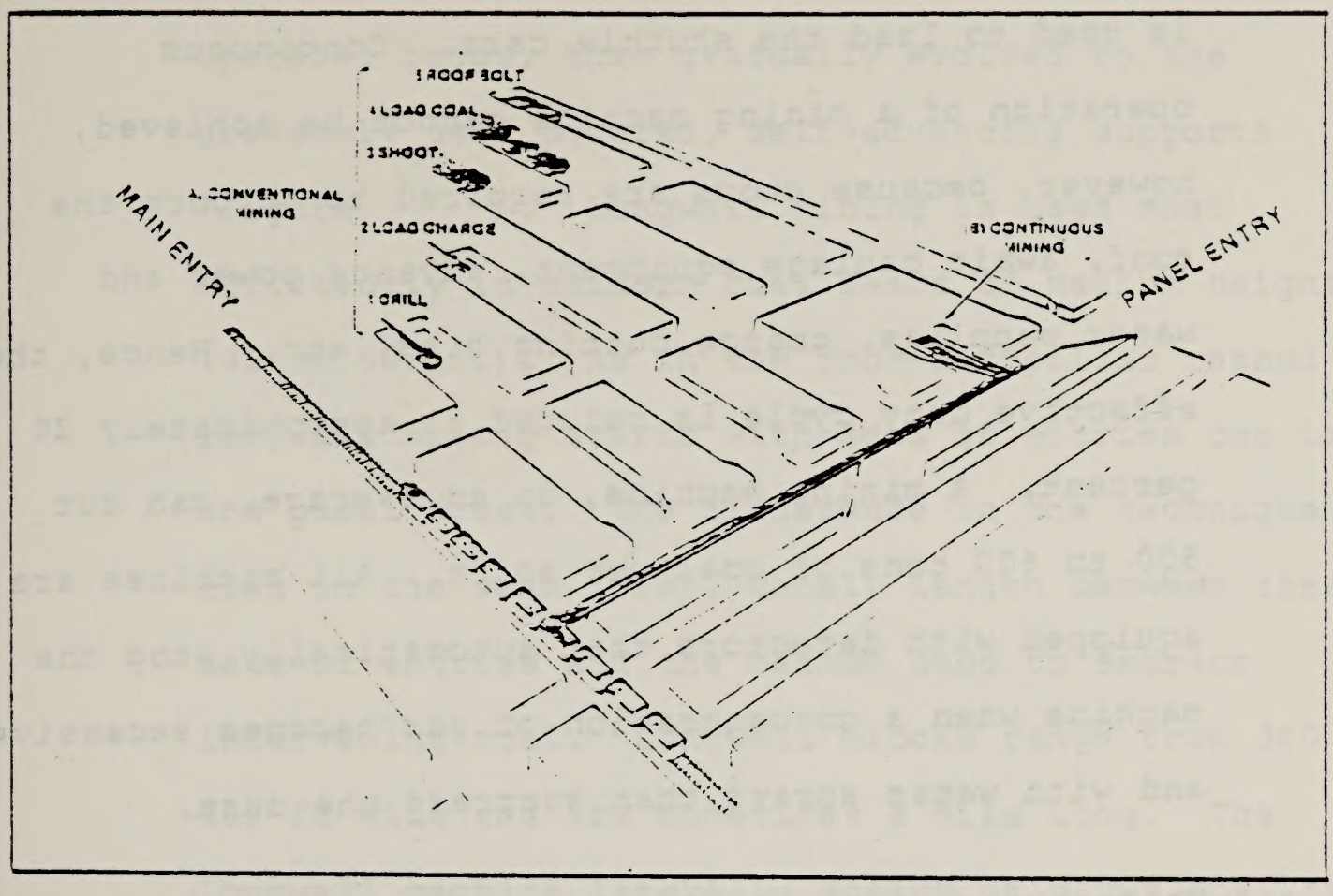



FIGURE
ROOM-AND-PILLAR MINING TECHNIQUES

Such machines are usually crawler-type vehicles operated by one man. They either load the coal into a shuttle car or pile it behind the machine. When coal is piled behind the machine, a mechanical loader is used to load the shuttle cars. Continuous operation of a mining machine cannot be achieved, however, because stops are required to support the roof, await haulage equipment, advance power and water supplies, change cutting bits, etc. Hence, the effective duty cycle is reduced to approximately 20 percent. A mining machine, on an average, can cut 500 to 600 tons of coal per shift. All machines are equipped with detectors that automatically stop the machine when a concentration of gas becomes excessive and with water sprays that suppress the dust.

- Where the entire thickness of the coal seam is mined, recovery averages about 50 percent nationwide. However, it is not always possible to take the entire coal seam thickness, because it often is necessary to leave part of it for roof support. Coal is left as roof support where the overlying strata is too weak to stand alone or to reduce pillar failure which increases with increases in height of the pillars. The latter is common practice in seams greater than ten feet in thickness. Roof bolts and timber are used for additional support.

- Contemporary longwall mining, first introduced to the United States in the 1950's, has long been practiced extensively in European mines. To support the roof at the face, longwall mining originally used manually operated props, than gradually evolved to the presently used powered, self-advancing supports (Figure ). Longwall mining is used most efficiently in uniform coal seams of medium height (42 to 60 in.). As in the room-and-pillar method longwall mining starts with sets of entries cut into the panel areas. The difference in the technique lies in the seam (i.e., panel) length between these sets of entries and the method used to extract intervening coal. Longwall blocks range from 300 to 600 ft wide and are sometimes a mile long. The longwall machine laterally shears or plows coal from the entire face, transports the fallen coal by an advancing conveyor to a secondary haulage conveyor, reverses direction at the end of a cut, and supports the roof in the area of the face by a self-advancing system of hyraulic jacks. The roof is allowed to cave behind the advancing work area; the roof is ocasionally blasted to ensure a controlled cave-in rate and to reduce overburden pressure on the coalbed being mined.

- The shortwall method of mining coal, a relatively new innovation, is best described as a method similar to longwall mining with two exceptions. The blocks of panels are smaller, usually ranging from 100 to 150

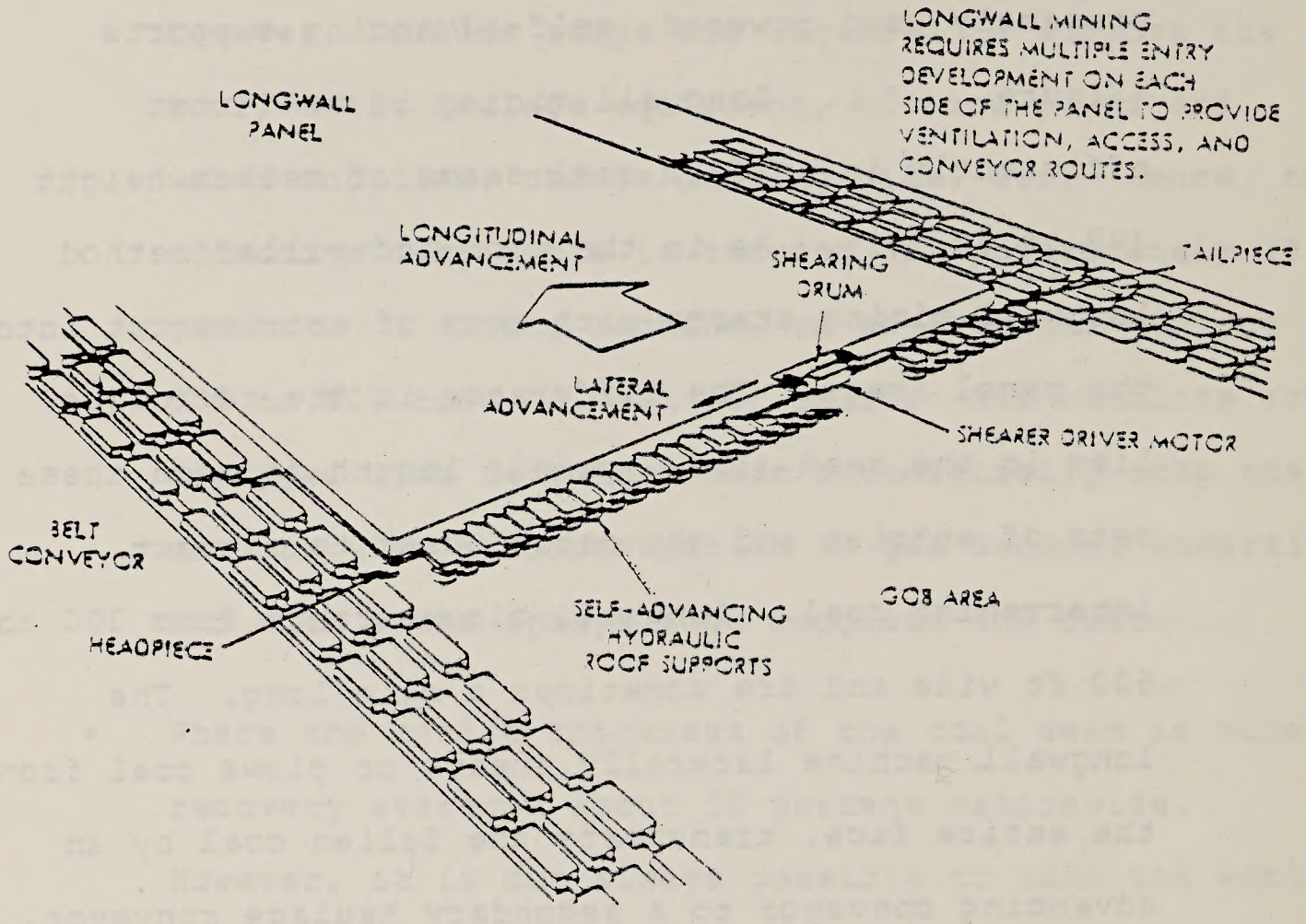



Figure Longwall mining.

ft wide and 300 to 500 ft long, and the coal is cut with a continuous miner and is loaded into shuttle cars.

- Surface Mining Strip and auger mining are the two most common surface methods of extracting coal in the United States. In the eastern United States, auger mining is used on hillside terrain. It requires a surface cut (removal of overburden and a portion of the coal bed) to allow the auger access to the bed. It is often used to recover part of the crop coal left from underground mining. In the western United States, auger mining is being tried as a means of recovering coal at strip mines where the overburden depth exceeds economic limits. Two other methods, open-pit and quarry-type mining, are being tried in thick, swallow-lying western coal seams and may become generally accepted where conditions warrant their use.

Strip mining is accomplished by two techniques, area stripping and contour stripping (Figure , ). Where coalbeds are relatively flat and near the surface, as in much of the west, area stripping is the dominant technique (Fluor Utah, 1975c). In area strip mining, overlying material (overburden) is removed from a seam of coal in long narrow parallel bands, or strips, followed by removal of the exposed coal. With the exception of the first cut (box cut), overburden from each cut is discarded in the previous cut from which the coal has been removed. These parallel cuts continue across the coal seam

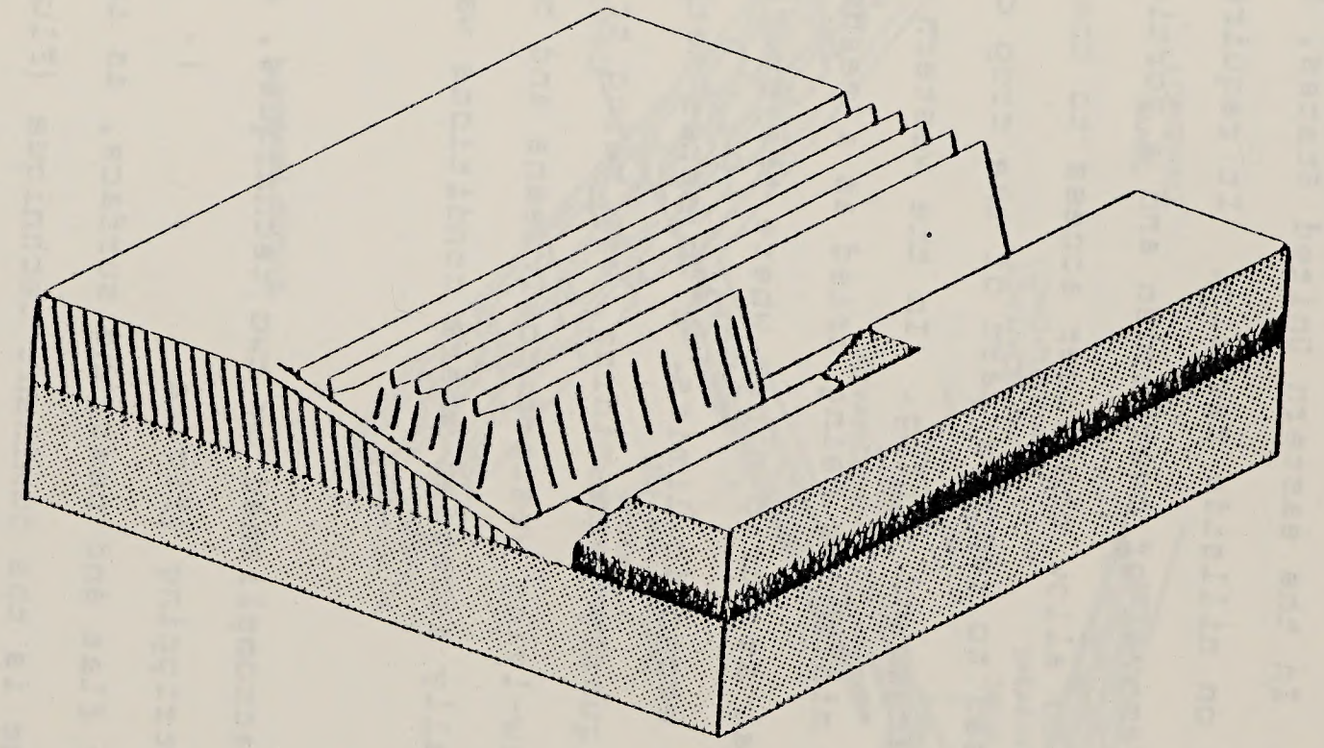


FIGURE
AREA STRIPPING WITH DRAGLINES -
HYPOTHETICAL PIT ARRANGEMENT
(ALL REQUIRED ROADS NOT SHOWN)

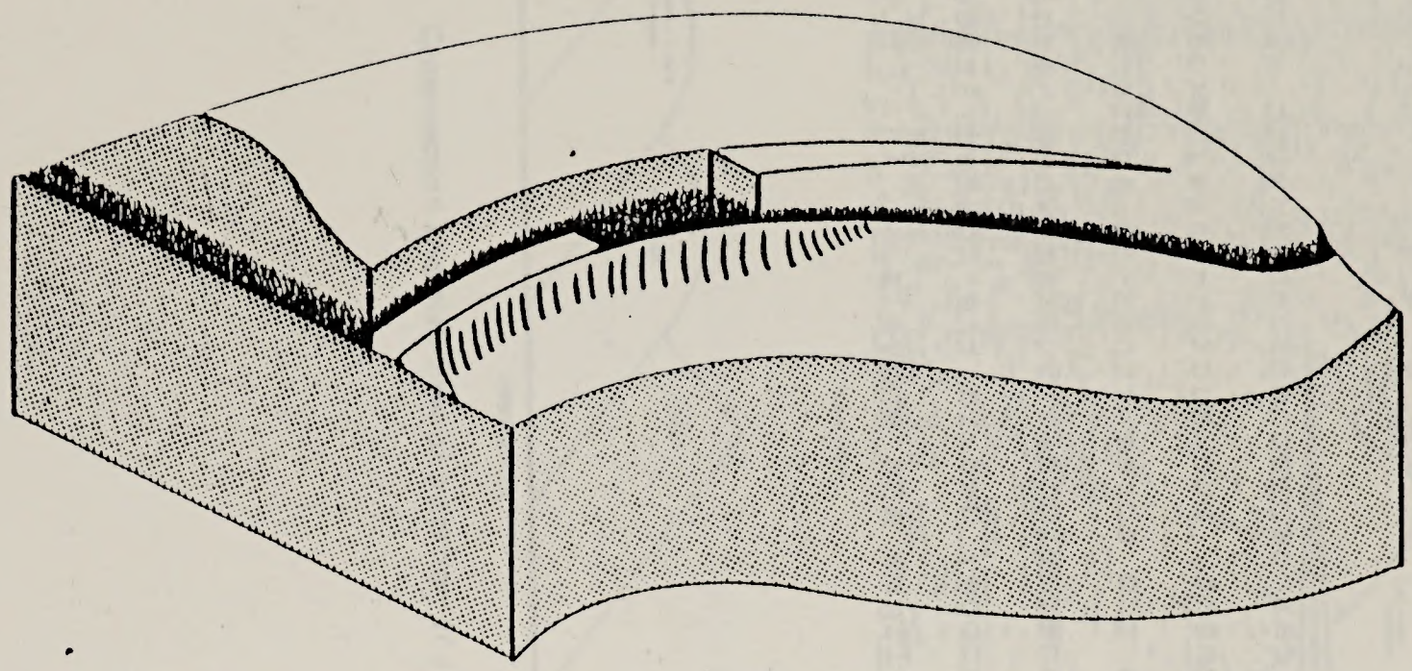
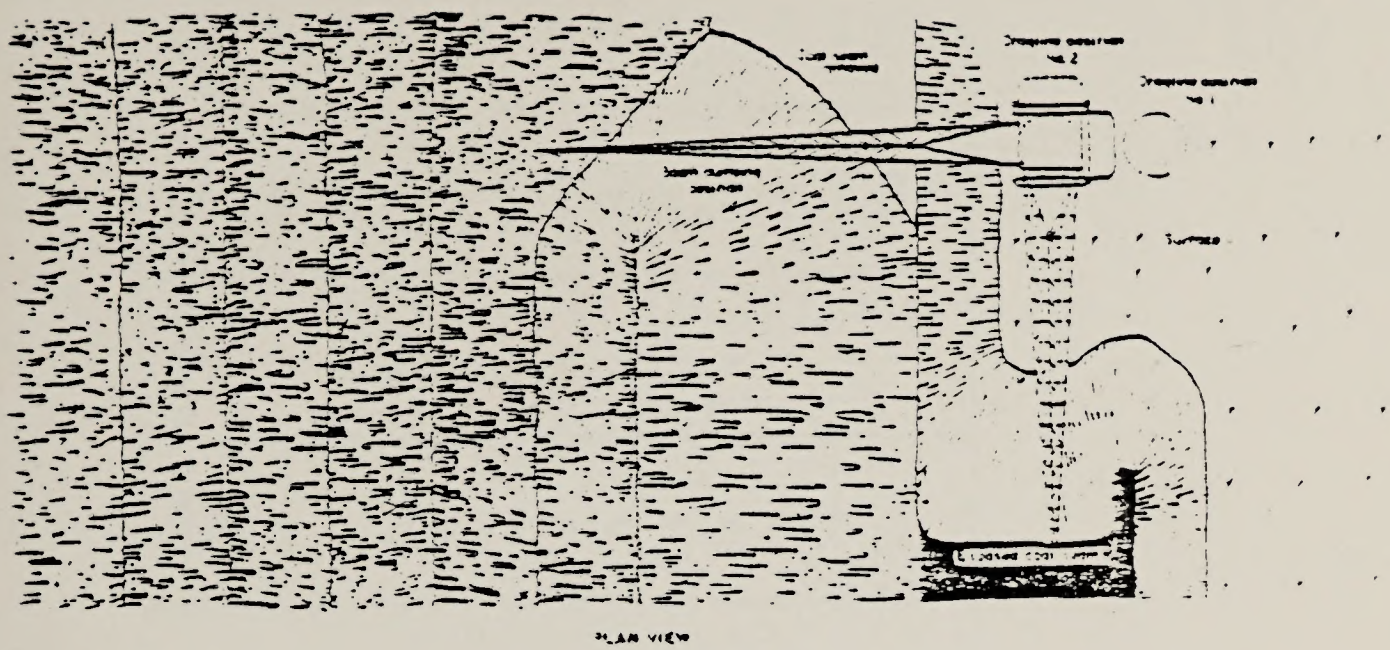


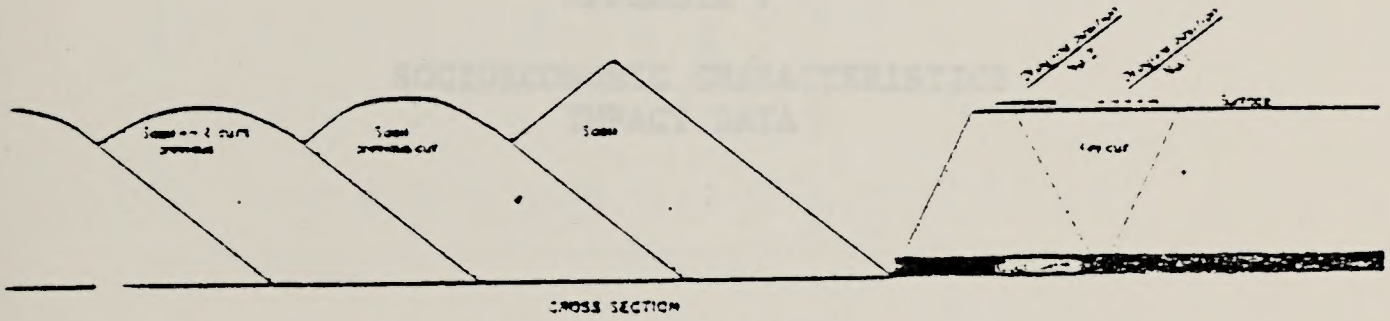
FIGURE
CONTOUR MINING - HYPOTHETICAL PIT ARRANGEMENT
(REQUIRED ROADS NOT SHOWN)

until the thickness of the overburden becomes too great to be removed economically or until the end of the coal seam or property is reached. Figure  depicts a cross-section and plan view of a portion of a strip coal mine. Both single and multiple seams, near the surface, can be mined in this manner.

Overburden removal can be accomplished with almost any kind of earth-moving equipment, but bucket-wheel excavators, draglines, and shovels are the three kinds of equipment used at the large area-stripping operations. Bucket-wheel excavators are used extensively in Europe, but in the United States, the dominant machines are draglines and shovels.



PLAN VIEW



CROSS SECTION

Figure . Cross-section and plan view of a portion of a strip coal mine.

# APPENDIX F

## SOCIOECONOMIC CHARACTERISTICS IMPACT DATA

TABLE F-1

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1985-1976 HIGH LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 184268 | 40539 | 2180 | 184 | 921 | 61361 | 22 | 16 | 479 | 387 | 369 |
| Central Appalachia | 26897 | 5917 | 318 | 27 | 134 | 8957 | 3 | 2 | 70 | 56 | 54 |
| Southern Appalachia | 115938 | 25506 | 1371 | 116 | 580 | 38607 | 14 | 10 | 301 | 243 | 232 |
| Eastern Interior | 144830 | 31863 | 1713 | 145 | 724 | 48228 | 17 | 12 | 373 | 304 | 270 |
| Western Interior | 115265 | 25358 | 1363 | 115 | 576 | 38383 | 14 | 10 | 300 | 342 | 231 |
| Texas | 158227 | 34810 | 1872 | 158 | 791 | 52690 | 19 | 13 | 411 | 332 | 316 |
| Powder River | 173134 | 38090 | 2048 | 173 | 866 | 27654 | 21 | 15 | 450 | 364 | 346 |
| Green River-Hams Fork | 75547 | 16400 | 882 | 75 | 373 | 24824 | 9 | 6 | 194 | 157 | 149 |
| Fort Union | 52907 | 11640 | 626 | 53 | 265 | 17618 | 6 | 4 | 138 | 111 | 106 |
| San Juan River | 31253 | 6876 | 370 | 31 | 156 | 10407 | 4 | 3 | 81 | 66 | 63 |
| Uinta-Southwest Utah | 67886 | 14935 | 803 | 68 | 339 | 22606 | 8 | 6 | 177 | 143 | 136 |
| Denver-Raton Mesa | 37097 | 8161 | 439 | 37 | 185 | 12353 | 4 | 3 | 96 | 78 | 74 |

TABLE F-2

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1990-1995 HIGH LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 376344 | 82796 | 11451 | 376 | 1882 | 125332 | 45 | 32 | 978 | 790 | 753 |
| Central Appalachia | 211619 | 46556 | 2503 | 212 | 1058 | 70469 | 25 | 18 | 550 | 444 | 423 |
| Southern Appalachia | 105004 | 23101 | 1242 | 105 | 525 | 34966 | 13 | 9 | 273 | 221 | 210 |
| Eastern Interior | 352389 | 77526 | 4168 | 352 | 1762 | 117346 | 42 | 30 | 916 | 740 | 705 |
| Western Interior | 180708 | 39756 | 2137 | 181 | 904 | 60176 | 22 | 15 | 470 | 379 | 361 |
| Texas | 324141 | 71311 | 3834 | 324 | 1621 | 107959 | 39 | 28 | 843 | 681 | 648 |
| Powder River | 238879 | 52553 | 2825 | 239 | 1194 | 79547 | 29 | 20 | 621 | 502 | 478 |
| Green River-Hams Fork | 47251 | 10395 | 559 | 47 | 236 | 15735 | 6 | 4 | 123 | 99 | 75 |
| Fort Union | 43982 | 9676 | 520 | 44 | 220 | 14646 | 5 | 4 | 114 | 92 | 88 |
| San Juan River | 58385 | 12845 | 691 | 58 | 292 | 194442 | 7 | 5 | 152 | 123 | 117 |
| Uinta-Southwest Utah | 53585 | 9589 | 516 | 44 | 218 | 14514 | 5 | 4 | 113 | 92 | 87 |
| Denver-Raton Mesa | 60032 | 13207 | 710 | 60 | 300 | 19991 | 7 | 5 | 156 | 126 | 120 |

TABLE F-3

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1985-1976 M10 LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 163332 | 35931 | 1932 | 163 | 817 | 54386 | 20 | 14 | 425 | 343 | 327 |
| Central Appalachia | 87608 | 19274 | 1036 | 88 | 438 | 29173 | 11 | 7 | 228 | 184 | 175 |
| Southern Appalachia | 86180 | 18960 | 1019 | 86 | 431 | 28698 | 10 | 7 | 224 | 181 | 172 |
| Eastern Interior | 190219 | 41848 | 2250 | 190 | 951 | 63343 | 23 | 16 | 495 | 399 | 380 |
| Western Interior | 99164 | 21816 | 1173 | 99 | 496 | 33022 | 12 | 8 | 258 | 208 | 198 |
| Texas | 186129 | 40948 | 2202 | 186 | 931 | 61981 | 22 | 16 | 484 | 391 | 372 |
| Powder River | 113286 | 24923 | 1340 | 113 | 566 | 37724 | 14 | 10 | 295 | 238 | 227 |
| Green River-Hams Fork | 48822 | 10741 | 577 | 49 | 244 | 16258 | 6 | 4 | 127 | 103 | 98 |
| Fort Union | 25597 | 5631 | 303 | 26 | 128 | 8524 | 3 | 2 | 67 | 54 | 51 |
| San Juan River | 13530 | 2977 | 160 | 14 | 68 | 4506 | 2 | 1 | 35 | 28 | 27 |
| Uinta-Southwest Utah | 43987 | 9677 | 520 | 44 | 220 | 14648 | 5 | 4 | 114 | 92 | 88 |
| Denver-Raton Mesa | 27157 | 5975 | 321 | 27 | 136 | 9043 | 3 | 2 | 71 | 57 | 54 |

TABLE F-4

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE *Preferred Alternative*

*1990-1995* *MID* LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 126419 | 27812 | 1495 | 126 | 632 | 42097 | 15 | 11 | 329 | 265 | 253 |
| Central Appalachia | 75745 | 16664 | 896 | 76 | 379 | 25223 | 9 | 6 | 197 | 159 | 151 |
| Southern Appalachia | 30518 | 6714 | 361 | 31 | 153 | 10163 | 4 | 3 | 79 | 64 | 61 |
| Eastern Interior | 241449 | 53119 | 2856 | 241 | 1207 | 80402 | 29 | 21 | 628 | 507 | 483 |
| Western Interior | 149935 | 32986 | 1773 | 150 | 750 | 49928 | 18 | 13 | 390 | 315 | 300 |
| Texas | 232876 | 51233 | 2754 | 233 | 1164 | 77548 | 28 | 20 | 605 | 489 | 466 |
| Powder River | 162475 | 35745 | 1922 | 162 | 812 | 54104 | 19 | 14 | 422 | 341 | 325 |
| Green River-Hams Fork | 36154 | 7954 | 428 | 36 | 181 | 12039 | 4 | 3 | 94 | 76 | 72 |
| Fort Union | 50582 | 11128 | 598 | 51 | 253 | 16844 | 6 | 4 | 132 | 106 | 101 |
| San Juan River | 17692 | 3892 | 209 | 18 | 88 | 5891 | 2 | 2 | 46 | 37 | 35 |
| Uinta-Southwest Utah | 27866 | 6131 | 330 | 28 | 139 | 9279 | 3 | 2 | 72 | 59 | 56 |
| Denver-Raton Mesa | 58415 | 12851 | 691 | 58 | 292 | 19452 | 7 | 5 | 152 | 123 | 117 |

TABLE F-6

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE BIFFARAO ALTERNATIVE

1985-1976 LOW LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 150062 | 33014 | 1775 | 150 | 750 | 49971 | 18 | 13 | 390 | 315 | 300 |
| Central Appalachia | 73965 | 16272 | 875 | 74 | 370 | 24630 | 9 | 6 | 192 | 155 | 148 |
| Southern Appalachia | 40030 | 8807 | 473 | 40 | 200 | 13330 | 5 | 3 | 104 | 84 | 80 |
| Eastern Interior | 177408 | 39030 | 2098 | 177 | 887 | 59077 | 21 | 15 | 461 | 373 | 355 |
| Western Interior | 70145 | 15432 | 830 | 70 | 351 | 23358 | 8 | 6 | 182 | 147 | 140 |
| Texas | 123609 | 27194 | 1462 | 124 | 618 | 41162 | 15 | 11 | 321 | 260 | 247 |
| Powder River | 83507 | 18372 | 988 | 84 | 418 | 27808 | 10 | 7 | 217 | 175 | 167 |
| Green River-Hams Fork | 21323 | 4691 | 252 | 21 | 107 | 7101 | 3 | 2 | 55 | 45 | 43 |
| Fort Union | 23011 | 5062 | 272 | 23 | 115 | 7663 | 3 | 2 | 60 | 48 | 46 |
| San Juan River | 6451 | 1419 | 76 | 6 | 32 | 2148 | 1 | 1 | 17 | 14 | 13 |
| Uinta-Southwest Utah | 21897 | 4813 | 259 | 22 | 109 | 7286 | 3 | 2 | 57 | 46 | 44 |
| Denver-Raton Mesa | 16356 | 3598 | 193 | 16 | 82 | 5446 | 2 | 1 | 43 | 34 | 33 |

TABLE F-6

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1990-1985 LOW LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | -2943 | -647 | -35 | -3 | -15 | -980 | 0 | 0 | -8 | -6 | -6 |
| Central Appalachia | 23139 | 5091 | 274 | 23 | 116 | 7705 | 3 | 2 | 60 | 49 | 46 |
| Southern Appalachia | -1561 | -343 | -18 | -2 | -8 | -520 | 0 | 0 | -4 | -3 | -3 |
| Eastern Interior | 158416 | 34851 | 1874 | 158 | 792 | 52752 | 19 | 13 | 412 | 333 | 317 |
| Western Interior | 18569 | 4085 | 220 | 19 | 93 | 6184 | 2 | 2 | 48 | 39 | 37 |
| Texas | 56804 | 12497 | 672 | 57 | 284 | 18916 | 7 | 5 | 148 | 119 | 114 |
| Powder River | 26959 | 5931 | 319 | 27 | 135 | 8977 | 3 | 2 | 70 | 57 | 54 |
| Green River-Hams Fork | 28524 | 6275 | 337 | 29 | 143 | 9499 | 3 | 2 | 74 | 60 | 57 |
| Fort Union | 10266 | 2259 | 121 | 10 | 51 | 3419 | 1 | 1 | 27 | 22 | 21 |
| San Juan River | 19711 | 4337 | 233 | 20 | 99 | 6564 | 2 | 2 | 51 | 41 | 39 |
| Uinta-Southwest Utah | 24358 | 5359 | 288 | 24 | 122 | 8111 | 3 | 2 | 63 | 51 | 49 |
| Denver-Raton Mesa | 24924 | 5483 | 295 | 25 | 125 | 8300 | 3 | 2 | 65 | 52 | 50 |

TABLE F-7

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE No LEASING ALTERNATIVE

1985 - 1976 HIGH LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 184931 | 40685 | 2187 | 185 | 925 | 61582 | 22 | 16 | 481 | 388 | 370 |
| Central Appalachia | 30396 | 6687 | 360 | 30 | 152 | 10122 | 4 | 3 | 79 | 64 | 61 |
| Southern Appalachia | 118932 | 26165 | 1407 | 119 | 595 | 39604 | 14 | 10 | 309 | 250 | 238 |
| Eastern Interior | 158202 | 34804 | 1871 | 153 | 791 | 52681 | 19 | 13 | 411 | 332 | 316 |
| Western Interior | 111073 | 24436 | 1314 | 111 | 555 | 36987 | 13 | 9 | 289 | 233 | 222 |
| Texas | 166387 | 36605 | 1968 | 166 | 832 | 55407 | 20 | 14 | 433 | 349 | 333 |
| Powder River | 157585 | 34669 | 1864 | 158 | 788 | 52476 | 19 | 13 | 410 | 331 | 315 |
| Green River-Hams Fork | 55881 | 12294 | 661 | 56 | 279 | 18608 | 7 | 5 | 145 | 117 | 112 |
| Fort Union | 52127 | 11468 | 617 | 52 | 261 | 17358 | 6 | 4 | 136 | 109 | 104 |
| San Juan River | 30794 | 6775 | 364 | 31 | 154 | 10254 | 4 | 3 | 80 | 65 | 62 |
| Uinta-Southwest Utah | 66657 | 14665 | 788 | 67 | 333 | 22197 | 8 | 6 | 173 | 140 | 133 |
| Denver-Raton Mesa | 36332 | 7993 | 430 | 36 | 182 | 12099 | 4 | 3 | 94 | 76 | 73 |

TABLE F-8

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE

1990-1995 HIGH LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 96308 | 21188 | 1139 | 96 | 482 | 32071 | 12 | 8 | 250 | 202 | 193 |
| Central Appalachia | 134344 | 29556 | 1589 | 134 | 672 | 44737 | 16 | 11 | 349 | 282 | 269 |
| Southern Appalachia | 33339 | 7335 | 394 | 33 | 167 | 11102 | 4 | 3 | 87 | 70 | 67 |
| Eastern Interior | 224802 | 49457 | 2657 | 225 | 1124 | 74859 | 27 | 19 | 584 | 472 | 450 |
| Western Interior | 140612 | 30935 | 1663 | 141 | 703 | 46824 | 17 | 12 | 366 | 295 | 281 |
| Texas | 255234 | 56152 | 3019 | 255 | 1276 | 84993 | 31 | 22 | 664 | 536 | 510 |
| Powder River | 59910 | 13180 | 709 | 60 | 300 | 19950 | 7 | 5 | 156 | 126 | 120 |
| Green River-Hams Fork | 25444 | 5598 | 301 | 25 | 127 | 8473 | 3 | 2 | 66 | 53 | 51 |
| Fort Union | 52086 | 11459 | 616 | 52 | 260 | 17345 | 6 | 4 | 135 | 109 | 104 |
| San Juan River | 16157 | 3554 | 191 | 16 | 81 | 5380 | 2 | 1 | 42 | 34 | 32 |
| Uinta-Southwest Utah | 36547 | 8040 | 432 | 37 | 183 | 12170 | 4 | 3 | 95 | 77 | 73 |
| Denver-Raton Mesa | 50898 | 11198 | 602 | 51 | 254 | 16949 | 6 | 4 | 132 | 107 | 102 |

TABLE F-7

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE

1985 - 1976 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 163256 | 35916 | 1931 | 163 | 816 | 54364 | 20 | 14 | 424 | 343 | 327 |
| Central Appalachia | 89255 | 19636 | 1056 | 89 | 446 | 29722 | 11 | 8 | 232 | 187 | 179 |
| Southern Appalachia | 88546 | 19480 | 1047 | 89 | 443 | 29486 | 11 | 8 | 230 | 186 | 177 |
| Eastern Interior | 185614 | 40835 | 2195 | 186 | 923 | 61809 | 22 | 16 | 483 | 390 | 371 |
| Western Interior | 97711 | 21496 | 1156 | 98 | 489 | 32538 | 12 | 8 | 254 | 205 | 195 |
| Texas | 182814 | 40219 | 2162 | 183 | 914 | 60877 | 22 | 16 | 475 | 384 | 366 |
| Powder River | 112567 | 24765 | 1331 | 113 | 563 | 37485 | 14 | 10 | 293 | 236 | 225 |
| Green River-Hams Fork | 45283 | 9962 | 536 | 45 | 226 | 15079 | 5 | 4 | 118 | 95 | 91 |
| Fort Union | 25541 | 5619 | 302 | 26 | 128 | 8505 | 3 | 2 | 66 | 54 | 51 |
| San Juan River | 13301 | 2926 | 157 | 13 | 67 | 4429 | 2 | 1 | 35 | 28 | 27 |
| Uinta-Southwest Utah | 43059 | 9473 | 509 | 43 | 215 | 14339 | 5 | 4 | 112 | 90 | 86 |
| Denver-Raton Mesa | 26984 | 5936 | 319 | 27 | 135 | 8986 | 3 | 2 | 70 | 57 | 54 |

TABLE F-10

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE No LEASING ALTERNATIVE

1990-1995 M10 LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 124542 | 27399 | 1473 | 125 | 623 | 41472 | 15 | 11 | 324 | 262 | 249 |
| Central Appalachia | 81421 | 17913 | 963 | 81 | 407 | 27113 | 10 | 7 | 212 | 171 | 163 |
| Southern Appalachia | 29646 | 6522 | 351 | 30 | 148 | 9872 | 4 | 3 | 77 | 62 | 59 |
| Eastern Interior | 262323 | 57711 | 3103 | 262 | 1312 | 87354 | 31 | 22 | 682 | 551 | 525 |
| Western Interior | 152265 | 33498 | 1801 | 152 | 761 | 50704 | 18 | 13 | 396 | 320 | 305 |
| Texas | 253852 | 55848 | 3003 | 254 | 1269 | 84533 | 30 | 22 | 660 | 533 | 508 |
| Powder River | 89908 | 19780 | 1063 | 90 | 450 | 29939 | 11 | 8 | 234 | 189 | 180 |
| Green River-Hams Fork | 20961 | 4611 | 248 | 21 | 105 | 6980 | 3 | 2 | 54 | 44 | 42 |
| Fort Union | 57543 | 12660 | 681 | 58 | 288 | 19162 | 7 | 5 | 150 | 121 | 115 |
| San Juan River | 24704 | 5435 | 292 | 25 | 124 | 8227 | 3 | 2 | 64 | 52 | 49 |
| Uinta-Southwest Utah | 34736 | 7642 | 411 | 35 | 174 | 11567 | 4 | 3 | 90 | 73 | 69 |
| Denver-Raton Mesa | 57676 | 12689 | 682 | 58 | 288 | 19206 | 7 | 5 | 150 | 121 | 115 |

TABLE F-11

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE

1985-1976 LOW LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 150037 | 33008 | 1775 | 150 | 750 | 49962 | 18 | 13 | 390 | 315 | 300 |
| Central Appalachia | 74037 | 16288 | 876 | 74 | 370 | 34654 | 9 | 6 | 192 | 155 | 148 |
| Southern Appalachia | 37745 | 8304 | 446 | 38 | 189 | 12569 | 5 | 3 | 98 | 79 | 75 |
| Eastern Interior | 177495 | 39049 | 2099 | 177 | 887 | 59106 | 21 | 15 | 461 | 373 | 355 |
| Western Interior | 70360 | 15479 | 832 | 70 | 352 | 23430 | 8 | 6 | 183 | 148 | 141 |
| Texas | 123624 | 27197 | 1462 | 124 | 618 | 41167 | 15 | 11 | 321 | 260 | 247 |
| Powder River | 83538 | 18378 | 988 | 84 | 418 | 27818 | 10 | 7 | 217 | 175 | 167 |
| Green River-Hams Fork | 21338 | 4694 | 252 | 21 | 107 | 7106 | 3 | 2 | 55 | 45 | 43 |
| Fort Union | 23047 | 5070 | 273 | 23 | 115 | 7675 | 3 | 2 | 60 | 48 | 46 |
| San Juan River | 6457 | 1420 | 76 | 6 | 32 | 2150 | 1 | 1 | 17 | 14 | 13 |
| Uinta-Southwest Utah | 21889 | 4816 | 259 | 22 | 109 | 7289 | 3 | 2 | 57 | 46 | 44 |
| Denver-Raton Mesa | 16386 | 3605 | 194 | 16 | 82 | 5457 | 2 | 1 | 43 | 34 | 33 |

TABLE F-12

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE

1990-1995 LOW LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | -2932 | -645 | -35 | -3 | -15 | -977 | 0 | 0 | -8 | -6 | -6 |
| Central Appalachia | 23210 | 5106 | 275 | 23 | 116 | 7729 | 3 | 2 | 60 | 49 | 46 |
| Southern Appalachia | 1785 | 393 | 21 | 2 | 9 | 594 | 0 | 0 | 5 | 4 | 4 |
| Eastern Interior | 159625 | 35117 | 1888 | 160 | 798 | 53155 | 19 | 14 | 415 | 335 | 319 |
| Western Interior | 18421 | 4053 | 218 | 18 | 92 | 6134 | 2 | 2 | 48 | 39 | 37 |
| Texas | 57870 | 12731 | 684 | 58 | 289 | 19271 | 7 | 5 | 150 | 122 | 116 |
| Powder River | 26607 | 5853 | 315 | 27 | 133 | 8860 | 3 | 2 | 69 | 56 | 53 |
| Green River-Hams Fork | 25296 | 5565 | 299 | 25 | 126 | 8424 | 3 | 2 | 66 | 53 | 51 |
| Fort Union | 10062 | 2214 | 119 | 10 | 50 | 3351 | 1 | 1 | 26 | 21 | 20 |
| San Juan River | 19043 | 4190 | 225 | 19 | 95 | 6341 | 2 | 2 | 50 | 40 | 38 |
| Uinta-Southwest Utah | 23312 | 5129 | 276 | 23 | 117 | 7763 | 3 | 2 | 61 | 49 | 47 |
| Denver-Raton Mesa | 24215 | 5327 | 286 | 24 | 121 | 8064 | 3 | 2 | 63 | 51 | 48 |

TABLE F- 13

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERENCE RIGHT LEASING ALTERNATIVE

1985-1976 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 163363 | 35940 | 1932 | 163 | 817 | 54400 | 20 | 14 | 425 | 343 | 327 |
| Central Appalachia | 89275 | 19641 | 1056 | 89 | 446 | 29729 | 11 | 8 | 232 | 187 | 179 |
| Southern Appalachia | 86751 | 19085 | 1026 | 87 | 434 | 28888 | 10 | 7 | 226 | 182 | 174 |
| Eastern Interior | 185425 | 40794 | 2193 | 185 | 927 | 61747 | 22 | 16 | 482 | 389 | 371 |
| Western Interior | 97231 | 21391 | 1150 | 97 | 486 | 32378 | 12 | 8 | 253 | 204 | 194 |
| Texas | 182529 | 40156 | 2159 | 183 | 913 | 60782 | 22 | 16 | 475 | 383 | 365 |
| Powder River | 112674 | 24788 | 1333 | 113 | 563 | 37520 | 14 | 10 | 293 | 237 | 225 |
| Green River-Hams Fork | 116803 | 10297 | 554 | 47 | 234 | 15585 | 6 | 4 | 122 | 98 | 94 |
| Fort Union | 25551 | 5621 | 302 | 26 | 128 | 8508 | 3 | 2 | 66 | 54 | 51 |
| San Juan River | 18240 | 4913 | 157 | 13 | 66 | 4409 | 2 | 1 | 34 | 28 | 26 |
| Uinta-Southwest Utah | 43442 | 9557 | 514 | 43 | 217 | 14466 | 5 | 4 | 113 | 91 | 87 |
| Denver-Raton Mesa | 27045 | 5950 | 320 | 27 | 135 | 9006 | 3 | 2 | 70 | 57 | 54 |

TABLE F-14

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERENCE RIGHT LEASING ALTERNATIVE

1990 - 1985 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 124200 | 27324 | 1469 | 124 | 621 | 41559 | 15 | 11 | 323 | 261 | 248 |
| Central Appalachia | 83405 | 18349 | 987 | 83 | 417 | 27774 | 10 | 7 | 217 | 175 | 167 |
| Southern Appalachia | 33589 | 7389 | 397 | 34 | 168 | 11185 | 4 | 3 | 87 | 71 | 67 |
| Eastern Interior | 236578 | 52047 | 2798 | 237 | 1183 | 78781 | 28 | 20 | 615 | 497 | 473 |
| Western Interior | 147660 | 32485 | 1747 | 148 | 738 | 49171 | 18 | 13 | 384 | 310 | 295 |
| Texas | 251976 | 55435 | 2980 | 252 | 1260 | 83908 | 30 | 21 | 655 | 529 | 504 |
| Powder River | 126735 | 27882 | 1499 | 127 | 634 | 42203 | 15 | 11 | 330 | 266 | 253 |
| Green River-Hams Fork | 22420 | 4932 | 265 | 22 | 112 | 7466 | 3 | 2 | 58 | 47 | 45 |
| Fort Union | 54963 | 12092 | 650 | 55 | 275 | 18303 | 7 | 5 | 143 | 115 | 110 |
| San Juan River | 22006 | 4841 | 260 | 22 | 110 | 7823 | 3 | 2 | 57 | 46 | 44 |
| Uinta-Southwest Utah | 29141 | 6411 | 345 | 29 | 146 | 9704 | 3 | 2 | 76 | 61 | 58 |
| Denver-Raton Mesa | 58354 | 12838 | 690 | 58 | 292 | 19432 | 7 | 5 | 152 | 123 | 117 |

TABLE F-15

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE SHORT TERM LEASING ALTERNATIVE

1985-1976 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 163246 | 35914 | 1931 | 163 | 816 | 54361 | 20 | 14 | 424 | 343 | 326 |
| Central Appalachia | 88204 | 19405 | 1043 | 88 | 441 | 29372 | 11 | 7 | 229 | 185 | 176 |
| Southern Appalachia | 88347 | 19436 | 1045 | 88 | 442 | 29420 | 11 | 8 | 230 | 186 | 177 |
| Eastern Interior | 186843 | 41106 | 2210 | 187 | 934 | 62219 | 22 | 16 | 486 | 392 | 374 |
| Western Interior | 98323 | 21631 | 1163 | 98 | 492 | 32741 | 12 | 8 | 256 | 206 | 197 |
| Texas | 183661 | 40405 | 2172 | 184 | 918 | 61159 | 22 | 16 | 478 | 386 | 367 |
| Powder River | 112863 | 24830 | 1335 | 113 | 564 | 37583 | 14 | 10 | 293 | 237 | 226 |
| Green River-Hams Fork | 46252 | 10175 | 547 | 46 | 231 | 15402 | 6 | 4 | 120 | 97 | 93 |
| Fort Union | 25566 | 5625 | 302 | 26 | 128 | 8514 | 3 | 2 | 66 | 54 | 51 |
| San Juan River | 13245 | 2914 | 157 | 13 | 66 | 4410 | 2 | 1 | 34 | 28 | 26 |
| Uinta-Southwest Utah | 43294 | 9525 | 512 | 43 | 216 | 14417 | 5 | 4 | 113 | 91 | 87 |
| Denver-Raton Mesa | 27055 | 5952 | 320 | 27 | 135 | 9009 | 3 | 2 | 70 | 57 | 54 |

TABLE F-16

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE SHORT TERM LEASING ALTERNATIVE

1990-1995 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 124578 | 27407 | 1473 | 125 | 623 | 41484 | 15 | 11 | 324 | 262 | 249 |
| Central Appalachia | 80901 | 17798 | 957 | 81 | 405 | 26940 | 10 | 7 | 210 | 170 | 162 |
| Southern Appalachia | 29988 | 6597 | 355 | 30 | 150 | 9986 | 4 | 3 | 78 | 63 | 60 |
| Eastern Interior | 256050 | 56331 | 3029 | 256 | 1280 | 85265 | 31 | 22 | 666 | 538 | 512 |
| Western Interior | 151587 | 33349 | 1793 | 152 | 758 | 50479 | 18 | 13 | 394 | 318 | 303 |
| Texas | 251001 | 55220 | 2969 | 251 | 1255 | 83583 | 30 | 21 | 653 | 527 | 502 |
| Powder River | 98057 | 21573 | 1160 | 98 | 490 | 32653 | 12 | 8 | 255 | 206 | 196 |
| Green River-Hams Fork | 24327 | 5352 | 288 | 24 | 122 | 8101 | 3 | 2 | 63 | 51 | 49 |
| Fort Union | 57446 | 12638 | 679 | 57 | 287 | 19130 | 7 | 5 | 149 | 121 | 115 |
| San Juan River | 24220 | 5328 | 286 | 24 | 121 | 8065 | 3 | 2 | 63 | 51 | 48 |
| Uinta-Southwest Utah | 34440 | 7577 | 407 | 34 | 172 | 11469 | 4 | 3 | 90 | 72 | 69 |
| Denver-Raton Mesa | 57900 | 12731 | 685 | 58 | 290 | 19281 | 7 | 5 | 151 | 122 | 116 |

TABLE F-17.

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE INDUSTRY NEED ALTERNATIVE

1985-1976 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 162695 | 35793 | 1924 | 163 | 813 | 54177 | 20 | 14 | 423 | 342 | 325 |
| Central Appalachia | 71431 | 15715 | 845 | 71 | 357 | 23786 | 9 | 6 | 186 | 150 | 143 |
| Southern Appalachia | 96043 | 21129 | 1136 | 96 | 480 | 31982 | 12 | 8 | 250 | 202 | 192 |
| Eastern Interior | 174037 | 38288 | 2059 | 174 | 870 | 57954 | 21 | 15 | 452 | 365 | 348 |
| Western Interior | 98318 | 21630 | 1163 | 98 | 492 | 32740 | 12 | 8 | 256 | 206 | 197 |
| Texas | 174960 | 38491 | 2069 | 175 | 875 | 58262 | 21 | 15 | 455 | 367 | 350 |
| Powder River | 125710 | 27656 | 1487 | 126 | 629 | 41861 | 15 | 11 | 327 | 264 | 251 |
| Green River-Hams Fork | 67855 | 14928 | .803 | 68 | 339 | 22596 | 8 | 6 | 176 | 142 | 136 |
| Fort Union | 29774 | 6550 | 352 | 30 | 149 | 9915 | 4 | 3 | 77 | 63 | 60 |
| San Juan River | 16657 | 3664 | 197 | 17 | 83 | 5547 | 2 | 1 | 43 | 35 | 33 |
| Uinta-Southwest Utah | 51061 | 11233 | 604 | 51 | 255 | 17003 | 6 | 4 | 133 | 107 | 102 |
| Denver-Raton Mesa | 28968 | 6373 | 343 | 29 | 145 | 9646 | 3 | 2 | 75 | 61 | 58 |

TABLE F-18

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE INDUSTRY NEED ALTERNATIVE

1990-1995 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 123369 | 27141 | 1459 | 123 | 617 | 41082 | 15 | 10 | 321 | 259 | 247 |
| Central Appalachia | 89780 | 19752 | 1062 | 90 | 449 | 29897 | 11 | 8 | 233 | 189 | 180 |
| Southern Appalachia | 31758 | 6987 | 376 | 32 | 159 | 10575 | 4 | 3 | 83 | 67 | 64 |
| Eastern Interior | 206147 | 45352 | 2438 | 206 | 1031 | 68647 | 25 | 18 | 536 | 433 | 412 |
| Western Interior | 152204 | 33485 | 1800 | 152 | 761 | 50684 | 18 | 13 | 396 | 320 | 304 |
| Texas | 222390 | 48926 | 2630 | 222 | 1112 | 74056 | 27 | 19 | 578 | 467 | 445 |
| Powder River | 184446 | 40578 | 2182 | 184 | 922 | 61421 | 22 | 16 | 480 | 387 | 369 |
| Green River-Hams Fork | 34746 | 7644 | 411 | 35 | 174 | 11571 | 4 | 3 | 90 | 73 | 69 |
| Fort Union | 56416 | 12412 | 667 | 56 | 282 | 18787 | 7 | 5 | 147 | 118 | 113 |
| San Juan River | 21996 | 4839 | 260 | 22 | 110 | 7325 | 3 | 2 | 57 | 46 | 44 |
| Uinta-Southwest Utah | 34654 | 7624 | 410 | 35 | 173 | 11540 | 4 | 3 | 90 | 73 | 69 |
| Denver-Raton Mesa | 54825 | 12061 | 648 | 55 | 274 | 18257 | 7 | 5 | 143 | 115 | 110 |

TABLE F-11

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE STATE DETERMINATION ALTERNATIVE

1985-1976 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 162669 | 35787 | 1924 | 163 | 813 | 54169 | 20 | 14 | 423 | 342 | 325 |
| Central Appalachia | 97129 | 21368 | 1149 | 97 | 486 | 32344 | 12 | 8 | 253 | 204 | 194 |
| Southern Appalachia | 79866 | 17570 | 945 | 80 | 399 | 26595 | 10 | 7 | 208 | 168 | 160 |
| Eastern Interior | 193682 | 42610 | 2291 | 194 | 968 | 64496 | 23 | 16 | 504 | 407 | 387 |
| Western Interior | 126235 | 27772 | 1493 | 126 | 631 | 42036 | 15 | 11 | 328 | 265 | 252 |
| Texas | 195937 | 43106 | 2318 | 196 | 980 | 65247 | 24 | 17 | 509 | 411 | 392 |
| Powder River | 100898 | 22198 | 1193 | 101 | 504 | 33599 | 12 | 9 | 262 | 212 | 202 |
| Green River-Hams Fork | 35700 | 7854 | 422 | 36 | 178 | 11888 | 4 | 3 | 93 | 75 | 71 |
| Fort Union | 29774 | 6550 | 352 | 30 | 149 | 9915 | 4 | 3 | 77 | 63 | 60 |
| San Juan River | 17773 | 3910 | 210 | 18 | 89 | 5919 | 2 | 2 | 46 | 37 | 36 |
| Uinta-Southwest Utah | 43340 | 9535 | 513 | 43 | 217 | 14432 | 5 | 4 | 113 | 91 | 87 |
| Denver-Raton Mesa | 27994 | 6159 | 331 | 28 | 140 | 9322 | 3 | 2 | 73 | 59 | 56 |

TABLE F-20

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE STATE DETERMINATION ALTERNATIVE

1990 -1985 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 136466 | 30022 | 1614 | 136 | 682 | 45443 | 16 | 12 | 355 | 287 | 273 |
| Central Appalachia | 91703 | 20175 | 1085 | 92 | 459 | 30537 | 11 | 8 | 238 | 193 | 183 |
| Southern Appalachia | 9532 | 2097 | 113 | 10 | 48 | 3174 | 1 | 1 | 25 | 20 | 19 |
| Eastern Interior | 330082 | 72618 | 3904 | 330 | 1650 | 109917 | 40 | 28 | 858 | 693 | 660 |
| Western Interior | 109859 | 24167 | 1299 | 110 | 549 | 36583 | 13 | 9 | 286 | 231 | 220 |
| Texas | 230581 | 50728 | 2727 | 231 | 1153 | 76783 | 28 | 20 | 600 | 484 | 461 |
| Powder River | 79708 | 17536 | 943 | 80 | 399 | 26543 | 10 | 7 | 207 | 167 | 159 |
| Green River-Hams Fork | 8461 | 1861 | 100 | 8 | 42 | 2817 | 1 | 1 | 22 | 18 | 17 |
| Fort Union | 54468 | 11983 | 644 | 54 | 272 | 18138 | 7 | 5 | 142 | 114 | 109 |
| San Juan River | 22873 | 5032 | 271 | 23 | 114 | 7617 | 3 | 2 | 59 | 40 | 46 |
| Uinta-Southwest Utah | 23893 | 5257 | 283 | 24 | 119 | 7957 | 3 | 2 | 62 | 50 | 48 |
| Denver-Raton Mesa | 53463 | 11762 | 632 | 53 | 267 | 17803 | 6 | 5 | 139 | 112 | 107 |

TABLE F-A1

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE DOE PRODUCTION ALTERNATIVE

1985-1976 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 136924 | 30123 | 1620 | 137 | 685 | 115596 | 16 | 12 | 356 | 288 | 274 |
| Central Appalachia | 24052 | 5291 | 284 | 24 | 120 | 8009 | 3 | 2 | 63 | 51 | 48 |
| Southern Appalachia | 76010 | 16722 | 899 | 76 | 380 | 25311 | 9 | 6 | 198 | 160 | 152 |
| Eastern Interior | 177214 | 38987 | 2096 | 177 | 886 | 59012 | 21 | 15 | 461 | 372 | 354 |
| Western Interior | 104443 | 22977 | 1235 | 104 | 522 | 34779 | 13 | 9 | 272 | 219 | 209 |
| Texas | 178255 | 39216 | 2108 | 178 | 891 | 59359 | 21 | 15 | 463 | 374 | 357 |
| Powder River | 110451 | 24299 | 1306 | 110 | 552 | 36780 | 13 | 9 | 287 | 232 | 221 |
| Green River-Hams Fork | 69074 | 15196 | 817 | 69 | 345 | 23002 | 8 | 6 | 180 | 145 | 138 |
| Fort Union | 18355 | 4038 | 217 | 18 | 92 | 6112 | 2 | 2 | 48 | 39 | 37 |
| San Juan River | 11995 | 2639 | 142 | 12 | 60 | 3994 | 1 | 1 | 31 | 25 | 24 |
| Uinta-Southwest Utah | 39030 | 8587 | 462 | 39 | 195 | 12997 | 5 | 3 | 101 | 82 | 78 |
| Denver-Raton Mesa | 28315 | 6229 | 335 | 28 | 142 | 9429 | 3 | 2 | 74 | 59 | 57 |

TABLE F-22

COAL PRODUCING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE DOE PRODUCTION ALTERNATIVE

1990-1995 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Appalachia | 93478 | 20565 | 1106 | 73 | 467 | 31128 | 11 | 8 | 243 | 196 | 187 |
| Central Appalachia | 107074 | 23556 | 1266 | 107 | 535 | 35656 | 13 | 9 | 278 | 225 | 214 |
| Southern Appalachia | 14663 | 3226 | 173 | 15 | 73 | 4883 | 2 | 1 | 38 | 31 | 29 |
| Eastern Interior | 250889 | 55196 | 2968 | 251 | 1254 | 83546 | 30 | 21 | 652 | 527 | 502 |
| Western Interior | 99144 | 21812 | 1173 | 99 | 496 | 33015 | 12 | 8 | 258 | 208 | 198 |
| Texas | 231198 | 50864 | 2735 | 231 | 1156 | 76989 | 28 | 20 | 601 | 486 | 462 |
| Powder River | 154703 | 34035 | 1830 | 155 | 774 | 51516 | 19 | 13 | 402 | 325 | 309 |
| Green River-Hams Fork | 30835 | 6784 | 365 | 31 | 154 | 10268 | 4 | 3 | 80 | 65 | 62 |
| Fort Union | 47527 | 10456 | 562 | 48 | 238 | 15826 | 6 | 4 | 124 | 100 | 95 |
| San Juan River | 48955 | 10770 | 579 | 49 | 245 | 16302 | 6 | 4 | 127 | 103 | 98 |
| Uinta-Southwest Utah | 17401 | 3828 | 206 | 17 | 87 | 5795 | 2 | 1 | 45 | 37 | 35 |
| Denver-Raton Mesa | 29468 | 6483 | 349 | 29 | 147 | 9813 | 4 | 3 | 77 | 62 | 59 |

# APPENDIX G

## POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON THE PREFERRED ALTERNATIVE, HIGH LEVEL COAL PRODUCTION, 1976-1985

TABLE G-1
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON THE PREFERRED ALTERNATIVE, HIGH LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 298,100 | 1,581,100 | - | 104,850 | 2,672,800 | 589,130 | - | 367,970 | - | 92,330 |
| Central Appalachia | 188,290 | 1,039,550 | - | 94,750 | 758,850 | 349,980 | - | 45,710 | - | - |
| Southern Appalachia | 157,630 | 840,160 | - | 65,640 | 670,570 | 568,230 | 1,107,120 | - | - | - |
| Eastern Interior | 256,350 | 595,180 | - | 66,280 | 8,838,630 | 2,053,630 | - | 609,840 | - | - |
| Western Interior | 177,180 | 430,060 | 155,700 | 68,580 | 2,084,890 | 584,160 | 711,940 | 770,270 | - | - |
| Texas | 202,440 | 695,740 | 400,280 | 53,630 | - | - | 4,495,860 | 235,360 | - | - |
| Powder River | 117,730 | 35,520 | 696,990 | 5,720 | - | - | - | 10,470 | 1,240 | 5,460 |
| Green River - Ham's Fork | 122,650 | 165,570 | 171,710 | 7,450 | 42,300 | - | | | | |
| Fort Union | 75,690 | 21,870 | 278,870 | 12,140 | - | - | - | 420,930 | - | 132,070 |
| San Juan | 49,140 | 181,060 | 79,430 | 3,100 | 9,790 | - | 36,480 | 17,050 | 360 | - |
| Uinta | 33,220 | 77,470 | 36,990 | 1,780 | 10,830 | - | - | 11,680 | 370 | - |
| Denver-Raton Mesa | 36,410 | 61,970 | 156,020 | 8,090 | 101,510 | - | 290 | 96,080 | 2,880 | - |

TABLE G-2
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON THE PREFERRED ALTERNATIVE, HIGH LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 298,100 | 20,870 | 70,000 | 2,980,000 | 1,040,000 | 750,000 | 600 | 136,120 |
| Central Appalachia | 188,290 | 13,180 | 50,000 | 1,880,000 | 660,000 | 470,000 | 380 | 85,980 |
| Southern Appalachia | 157,630 | 11,030 | 40,000 | 1,580,000 | 550,000 | 390,000 | 320 | 71,980 |
| Eastern Interior | 256,350 | 15,380 | 50,000 | 2,560,000 | 900,000 | 640,000 | 510 | 150,790 |
| Western Interior | 177,180 | 5,320 | 40,000 | 1,770,000 | 620,000 | 440,000 | 350 | 68,150 |
| Texas | 202,440 | 12,150 | 40,000 | 2,020,000 | 710,000 | 710,000 | 400 | 30,670 |
| Powder River | 117,730 | 4,760 | 3,532 | 1,060,000 | 120,000 | 290,000 | 240 | 7,600 |
| Green River - Ham's Fork | 122,650 | 2,490 | 19,624 | 6,750,000 | 310,000 | 550,000 | 250 | 13,190 |
| Fort Union | 75,690 | 3,200 | 10,597 | 680,000 | 8,000 | 19,000 | 150 | 9,230 |
| San Juan | 49,140 | 80 | 9,828 | 250,000 | 420,000 | 130,000 | 150 | 4,450 |
| Uinta | 33,220 | 330 | 6,644 | 170,000 | 80,000 | 90,000 | 70 | 4,000 |
| Denver-Raton Mesa | 36,410 | 580 | 7,282 | 330,000 | 900,000 | 90,000 | 70 | 2,230 |

TABLE G-3

POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON THE PREFERRED ALTERNATIVE, HIGH LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 224,900 | 1,192,855 | | 79,105 | 2,064,800 | 444,470 | | 277,615 | | 69,655 |
| Central Appalachia | 139,550 | 707,460 | | 70,225 | 562,415 | 259,385 | | 33,875 | | |
| Southern Appalachia | 110,435 | 588,615 | | 45,985 | 469,800 | 398,100 | 705,585 | | | |
| Eastern Interior | 157,920 | 366,650 | | 40,835 | 5,444,885 | 1,265,245 | | 375,680 | | |
| Western Interior | 145,220 | 352,485 | 127,615 | 56,210 | 1,708,815 | 478,785 | 583,520 | 631,325 | | |
| Texas | 224,020 | 769,905 | 442,950 | 59,350 | | | 975,115 | 160,445 | | |
| Powder River | 107,285 | 32,370 | 635,155 | 5,210 | | | | 95,410 | 1,125 | 4,970 |
| Green River - Ham's Fork | 79,700 | 109,595 | 111,580 | 4,840 | 27,485 | | | 31,805 | 1,175 | 1,340 |
| Fort Union | 53,020 | 15,325 | 195,340 | 9,065 | | | | 294,860 | | 92,615 |
| San Juan | 46,800 | 172,435 | 75,650 | 2,955 | 9,320 | | 34,740 | 16,235 | 345 | |
| Uinta | 23,240 | 54,195 | 25,875 | 1,245 | 7,575 | | | 8,170 | 255 | |
| Denver-Raton Mesa | 28,550 | 48,595 | 122,340 | 6,340 | 79,600 | | 230 | 75,335 | 2,260 | |

TABLE G-4
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON
THE PREFERRED ALTERNATIVE, HIGH LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 224,900 | 15,745 | 55,000 | 2,250,000 | 785,000 | 560,000 | 450 | 102,695 |
| Central Appalachia | 139,550 | 9,770 | 35,000 | 1,395,000 | 490,000 | 350,000 | 280 | 63,720 |
| Southern Appalachia | 110,435 | 7,730 | 30,000 | 1,105,000 | 385,000 | 275,000 | 220 | 50,425 |
| Eastern Interior | 157,920 | 9,475 | 30,000 | 1,580,000 | 555,000 | 395,000 | 315 | 92,895 |
| Western Interior | 145,220 | 4,355 | 30,000 | 1,450,000 | 510,000 | 365,000 | 290 | 55,855 |
| Texas | 224,020 | 13,440 | 15,000 | 2,240,000 | 785,000 | 785,000 | 495 | 33,940 |
| Powder River | 107,285 | 4,340 | 3,219 | 965,000 | 105,000 | 270,000 | 215 | 6,920 |
| Green River - Ham's Fork | 79,700 | 1,615 | 12,752 | 4,385,000 | 200,000 | 360,000 | 160 | 8,570 |
| Fort Union | 53,020 | 2,240 | 7,422 | 475,000 | 55,000 | 135,000 | 105 | 6,465 |
| San Juan | 46,800 | 75 | 10,000 | 235,000 | 115,000 | 120,000 | 140 | 4,240 |
| Uinta | 23,240 | 235 | 4,648 | 115,000 | 60,000 | 60,000 | 45 | 2,800 |
| Denver-Raton Mesa | 28,550 | 450 | 5,710 | 225,000 | 70,000 | 75,000 | 55 | 1,750 |

TABLE G-5
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON THE PREFERRED ALTERNATIVE, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 282,480 | 1,498,250 | - | 99,360 | 2,532,750 | 558,260 | - | 348,690 | - | 87,490 |
| Central Appalachia | 223,310 | 1,232,810 | - | 112,380 | 899,980 | 415,070 | - | 54,210 | - | - |
| Southern Appalachia | 149,740 | 80,810 | - | 62,350 | 637,010 | 539,790 | 956,710 | - | - | - |
| Eastern Interior | 264,550 | 614,210 | - | 68,400 | 9,121,360 | 2,119,560 | - | 629,350 | - | - |
| Western Interior | 161,810 | 392,760 | 142,200 | 62,630 | 1,904,030 | 533,480 | 650,180 | 703,450 | - | - |
| Texas | 240,890 | 787,870 | 476,300 | 63,820 | - | - | 5,349,770 | 280,060 | - | - |
| Powder River | 84,460 | 25,480 | 500,020 | 4,100 | - | - | - | 75,110 | 890 | 3,910 |
| Green River - Ham's Fork | 85,710 | 115,710 | 119,990 | 5,700 | 29,560 | - | - | 34,200 | 1,260 | 1,440 |
| Fort Union | 45,050 | 13,070 | 165,980 | 7,700 | - | - | - | 250,540 | - | 78,610 |
| San Juan | 31,090 | 114,550 | 50,260 | 1,960 | 6,190 | - | 23,080 | 10,790 | 230 | - |
| Uinta | 28,690 | 66,910 | 31,940 | 1,540 | 9,350 | - | - | 10,090 | 320 | - |
| Denver-Raton Mesa | 30,480 | 51,880 | 130,610 | 6,770 | 84,980 | - | 250 | 80,430 | 2,410 | - |

TABLE G-6

POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON THE PREFERRED ALTERNATIVE, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 282,480 | 19,770 | 70,000 | 2,820,000 | 990,000 | 710,000 | 560 | 128,990 |
| Central Appalachia | 223,310 | 15,630 | 60,000 | 2,230,000 | 780,000 | 560,000 | 450 | 101,970 |
| Southern Appalachia | 149,740 | 10,480 | 40,000 | 1,500,000 | 520,000 | 370,000 | 300 | 68,370 |
| Eastern Interior | 264,550 | 15,870 | 50,000 | 2,650,000 | 930,000 | 660,000 | 530 | 155,620 |
| Western Interior | 161,810 | 4,850 | 30,000 | 1,620,000 | 570,000 | 400,000 | 320 | 62,230 |
| Texas | 240,890 | 14,450 | 50,000 | 2,410,000 | 840,000 | 840,000 | 480 | 36,500 |
| Powder River | 84,460 | 3,410 | 2,534 | 760,000 | 80,000 | 210,000 | 170 | 5,450 |
| Green River - Ham's Fork | 85,710 | 1,730 | 13,714 | 4,710,000 | 210,000 | 390,000 | 170 | 9,220 |
| Fort Union | 45,050 | 1,900 | 6,307 | 410,000 | 50,000 | 110,000 | 90 | 5,490 |
| San Juan | 31,090 | 50 | 6,218 | 160,000 | 80,000 | 80,000 | 90 | 2,820 |
| Uinta | 28,690 | 290 | 5,738 | 140,000 | 70,000 | 70,000 | 60 | 3,460 |
| Denver-Raton Mesa | 30,480 | 480 | 6,096 | 270,000 | 80,000 | 80,000 | 60 | 1,870 |

TABLE G-7
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON THE PREFERRED ALTERNATIVE, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 157,555 | 835,660 | | 55,420 | 1,412,655 | 311,375 | - - | 194,485 | - - | 49,000 |
| Central Appalachia | 127,165 | 702,080 | - - | 63,995 | 512,500 | 236,365 | - - | 30,870 | - - | - - |
| Southern Appalachia | 80,170 | 434,495 | - - | 33,945 | 346,795 | 293,865 | 520,840 | - - | - - | - - |
| Eastern Interior | 140,315 | 325,775 | - - | 36,280 | 4,837,885 | 1,124,195 | - - | 333,800 | - - | - - |
| Western Interior | 128,460 | 311,810 | 112,890 | 49,725 | 1,511,600 | 423,530 | 516,175 | 558,460 | - - | - - |
| Texas | 205,675 | 707,375 | 406,970 | 54,530 | - - | - - | 4,571,030 | 239,290 | - - | - - |
| Powder River | 77,165 | 23,280 | 456,835 | 3,745 | - - | - - | - - | 68,625 | 810 | 3,575 |
| Green River - Ham's Fork | 57,265 | 77,305 | 80,170 | 3,475 | 19,750 | - - | - - | 22,850 | 845 | 960 |
| Fort Union | 40,105 | 11,590 | 147,760 | 6,855 | - - | - - | - - | 223,035 | - - | 69,980 |
| San Juan | 21,130 | 77,855 | 34,155 | 1,335 | 4,210 | - - | 15,685 | 7,330 | 155 | - - |
| Uinta | 16,875 | 39,350 | 18,790 | 905 | 5,500 | - - | - - | 5,935 | 185 | - - |
| Denver-Raton Mesa | 30,735 | 52,315 | 131,705 | 6,825 | 85,690 | - - | 250 | 81,100 | 2,435 | - - |

TABLE G—8

POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON THE PREFERRED ALTERNATIVE, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 157,555 | 11,030 | 40,000 | 1,575,000 | 550,000 | 395,000 | 315 | 72,000 |
| Central Appalachia | 127,165 | 8,900 | 30,000 | 1,270,000 | 445,000 | 320,000 | 255 | 58,000 |
| Southern Appalachia | 80,170 | 5,705 | 20,000 | 815,000 | 285,000 | 205,000 | 165 | 37,225 |
| Eastern Interior | 140,315 | 8,420 | 30,000 | 1,405,000 | 490,000 | 350,000 | 280 | 82,540 |
| Western Interior | 128,460 | 3,855 | 25,000 | 1,285,000 | 450,000 | 320,000 | 255 | 49,410 |
| Texas | 205,675 | 12,350 | 40,000 | 2,060,000 | 720,000 | 720,000 | 410 | 31,185 |
| Powder River | 77,165 | 3,120 | 2,315 | 695,000 | 75,000 | 195,000 | 155 | 4,980 |
| Green River - Ham's Fork | 57,265 | 1,160 | 10,000 | 3,150 | 145,000 | 260,000 | 3615 | 6,160 |
| Fort Union | 40,105 | 1,700 | 5,615 | 360,000 | 40,000 | 100,000 | 80 | 4,890 |
| San Juan | 21,130 | 35 | 4,226 | 105,000 | 35,000 | 55,000 | 65 | 1,115 |
| Uinta | 16,875 | 165 | 3,375 | 85,000 | 40,000 | 45,000 | 35 | 2,035 |
| Denver-Raton Mesa | 30,735 | 480 | 6,147 | 275,000 | 75,000 | 80,000 | 60 | 1,885 |

TABLE G-9
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON THE PREFERRED ALTERNATIVE, LOW LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 287,770 | 1,526,310 | - - | 101,220 | 2,580,180 | 568,772 | - - | 355,220 | - - | 89,130 |
| Central Appalachia | 213,590 | 1,179,230 | - - | 107,490 | 860,810 | 397,010 | - - | 51,850 | - - | - - |
| Southern Appalachia | 112,160 | 597,810 | - - | 46,700 | 477,140 | 404,320 | 716,610 | - - | - - | - - |
| Eastern Interior | 260,800 | 605,510 | - - | 67,430 | 8,992,060 | 2,089,520 | - - | 620,430 | - - | - - |
| Western Interior | 136,580 | 331,510 | 120,020 | 52,870 | 1,607,150 | 450,300 | 548,800 | 593,760 | - - | - - |
| Texas | 172,370 | | 340,820 | 45,670 | - - | - - | 3,828,050 | 200,400 | - - | - - |
| Powder River | 71,800 | 21,660 | 425,070 | 3,490 | - - | - - | - - | 63,850 | 750 | 3,330 |
| Green River - Ham's Fork | 49,920 | 67,400 | 69,890 | 3,030 | 17,270 | - - | - - | 19,920 | 730 | 840 |
| Fort Union | 43,940 | 12,700 | 161,890 | 7,510 | - - | - - | - - | 244,360 | - - | 76,670 |
| San Juan | 22,730 | 83,750 | 36,740 | 1,430 | 4,530 | - - | 16,870 | 7,890 | 170 | - - |
| Uinta | 25,500 | 59,470 | 28,390 | 1,370 | 8,310 | - - | - - | 8,970 | 280 | - - |
| Denver-Raton Mesa | 21,960 | 37,380 | 94,100 | 4,880 | 61,230 | - - | 180 | 57,950 | 1,740 | - - |

TABLE G-10
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON THE PREFERRED ALTERNATIVE, LOW LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 287,770 | 20,140 | 70,000 | 2,680,000 | 1,010,000 | 720,000 | 580 | 131,400 |
| Central Appalachia | 213,590 | 14,950 | 50,000 | 2,140,000 | 750,000 | 530,000 | 430 | 97,530 |
| Southern Appalachia | 112,160 | 7,850 | 30,000 | 1,120,000 | 390,000 | 280,000 | 220 | 51,210 |
| Eastern Interior | 260,800 | 15,650 | 50,000 | 2,610,000 | 910,000 | 650,000 | 520 | 153,410 |
| Western Interior | 136,580 | 4,100 | 30,000 | 1,370,000 | 480,000 | 340,000 | 270 | 52,530 |
| Texas | 172,370 | 10,340 | 30,000 | 1,720,000 | 600,000 | 600,000 | 340 | 26,170 |
| Powder River | 71,806 | 2,900 | 2,154 | 650,000 | 70,000 | 180,000 | 140 | 4,630 |
| Green River - Ham's Fork | 49,920 | 1,010 | 7,987 | 2,750,000 | 120,000 | 220,000 | 100 | 5,370 |
| Fort Union | 43,940 | 1,860 | 6,152 | 400,000 | 40,000 | 110,000 | 90 | 5,360 |
| San Juan | 22,730 | 40 | 4,546 | 110,000 | 60,000 | 70,000 | 60 | 2,060 |
| Uinta | 25,500 | 260 | 5,100 | 130,000 | 60,000 | 70,000 | 50 | 3,070 |
| Denver-Raton Mesa | 21,960 | 340 | 4,392 | 200,000 | 50,000 | 60,000 | 40 | 1,350 |

TABLE G-11
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON THE PREFERRED ALTERNATIVE, LOW LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 136,540 | 724,200 | - - | 48,025 | 1,224,235 | 269,845 | - - | 168,545 | - - | 42,290 |
| Central Appalachia | 112,335 | 620,205 | - - | 56,530 | 452,735 | 208,800 | - - | 27,270 | - - | - - |
| Southern Appalachia | 54,075 | 57,643 | - - | 22,515 | 230,040 | 194,930 | 345,495 | - - | - - | - - |
| Eastern Interior | 131,400 | 305,075 | - - | 33,975 | 4,530,510 | 1,052,770 | - - | 312,590 | - - | - - |
| Western Interior | 69,350 | 168,330 | 60,945 | 26,845 | 816,045 | 228,645 | 278,660 | 301,490 | - - | - - |
| Texas | 107,670 | 370,035 | 212,895 | 28,525 | - - | - - | 2,391,170 | 125,175 | - - | - - |
| Powder River | 42,360 | 12,780 | 250,780 | 2,055 | - - | - - | - - | 37,670 | 445 | 1,965 |
| Green River - Ham's Fork | 38,490 | 51,965 | 53,885 | 2,335 | 13,275 | - - | - - | 15,360 | 565 | 645 |
| Fort Union | 25,575 | 7,390 | 94,225 | 4,370 | - - | - - | - - | 142,230 | - - | 44,625 |
| San Juan | 17,400 | 64,110 | 28,125 | 1,100 | 3,465 | - - | 12,915 | 6,035 | 130 | - - |
| Uinta | 17,540 | 40,900 | 19,530 | 940 | 5,715 | - - | - - | 6,165 | 195 | - - |
| Denver-Raton Mesa | 17,210 | 29,295 | 73,745 | 3,825 | 47,985 | - - | 140 | 45,410 | 1,360 | - - |

TABLE G-12
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON THE PREFERRED ALTERNATIVE, LOW LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 136,540 | 9,560 | 35,000 | 1,365,000 | 480,000 | 340,000 | 275 | 62,000 |
| Central Appalachia | 112,335 | 7,865 | 30,000 | 1,125,000 | 395,000 | 280,000 | 225 | 51,000 |
| Southern Appalachia | 54,075 | 3,785 | 15,000 | 540,000 | 190,000 | 135,000 | 110 | 25,000 |
| Eastern Interior | 131,400 | 7,085 | 25,000 | 1,315,000 | 460,000 | 330,000 | 265 | 77,000 |
| Western Interior | 69,350 | 2,080 | 15,000 | 695,000 | 245,000 | 175,000 | 140 | 27,000 |
| Texas | 107,670 | 6,460 | 20,000 | 1,075,000 | 375,000 | 375,000 | 215 | 16,000 |
| Powder River | 42,360 | 1,210 | 1,155 | 380,000 | 40,000 | 105,000 | 85 | 2,735 |
| Green River - Ham's Fork | 38,490 | 780 | 5,000 | 2,115,000 | 95,000 | 175,000 | 75 | 4,140 |
| Fort Union | 25,575 | 1,080 | 3,580 | 230,000 | 25,000 | 65,000 | 50 | 3,120 |
| San Juan | 17,400 | 30 | 5,000 | 85,000 | 45,000 | 45,000 | 50 | 1,575 |
| Uinta | 17,540 | 175 | 5,000 | 90,000 | 45,000 | 45,000 | 35 | 2,115 |
| Denver-Raton Mesa | 17,210 | 270 | 3,442 | 155,000 | 45,000 | 45,000 | 35 | |

TABLE G-13

POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON NO NEW FEDERAL LEASING, HIGH LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 298,410 | 1,582,740 | - - | 104,960 | 2,675,580 | 589,750 | - - | 368,350 | - - | 92,420 |
| Central Appalachia | 189,310 | 1,045,190 | - - | 95,270 | 762,960 | 351,880 | - - | 45,950 | - - | - - |
| Southern Appalachia | 158,010 | 842,180 | - - | 65,800 | 672,190 | 569,600 | 1,009,550 | - - | - - | - - |
| Eastern Interior | 25,860 | 600,400 | - - | 66,860 | 8,916,210 | 2,071,890 | - - | 615,190 | - - | - - |
| Western Interior | 172,960 | 419,820 | 151,990 | 66,950 | 2,035,230 | 570,240 | 694,980 | 751,920 | - - | - - |
| Texas | 214,190 | 736,120 | 423,510 | 56,740 | - - | - - | 4,756,800 | 24,902 | - - | - - |
| Powder River | 109,470 | 33,030 | 648,090 | 5,310 | - - | - - | - - | 97,360 | 1,150 | 5,070 |
| Green River - Ham's Fork | 97,770 | 131,990 | 136,880 | 5,940 | 33,720 | - - | - - | 39,010 | 1,440 | 1,640 |
| Fort Union | 75,030 | 21,680 | 276,430 | 12,830 | - - | - - | - - | 41,726 | - - | 130,920 |
| San Juan | 48,840 | 17,995 | 78,950 | 3,080 | 9,730 | - - | 36,250 | 16,940 | 360 | - - |
| Uinta | 32,480 | 75,740 | 36,160 | 1,740 | 10,590 | - - | - - | 11,420 | 360 | - - |
| Denver-Raton Mesa | 35,770 | 60,890 | 153,280 | 7,950 | 99,730 | - - | 290 | 94,390 | 2,830 | - - |

TABLE G-14
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON
NO NEW FEDERAL LEASING, HIGH LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 298,410 | 20,890 | 70,000 | 2,980,000 | 1,040,000 | 750,000 | 600 | 136,000 |
| Central Appalachia | 189,310 | 13,250 | 50,000 | 1,890,000 | 660,000 | 470,000 | 380 | 8,644 |
| Southern Appalachia | 158,010 | 11,060 | 40,000 | 1,580,000 | 550,000 | 400,000 | 320 | 72,150 |
| Eastern Interior | 258,600 | 15,520 | 50,000 | 2,590,000 | 910,000 | 650,000 | 520 | 152,000 |
| Western Interior | 172,960 | 5,190 | 30,000 | 1,730,000 | 61,000 | 430,000 | 350 | 66,520 |
| Texas | 214,190 | 12,850 | 40,000 | 2,140,000 | 750,000 | 750,000 | 430 | 32,450 |
| Powder River | 109,470 | 4,420 | 3,284 | 990,000 | 110,000 | 270,000 | 220 | 7,060 |
| Green River - Ham's Fork | 97,770 | 1,990 | 20,000 | 5,380,000 | 240,000 | 440,000 | 200 | 10,510 |
| Fort Union | 75,030 | 3,180 | 10,504 | 680,000 | 80,000 | 190,000 | 150 | 9,150 |
| San Juan | 48,840 | 80 | 9,768 | 240,000 | 120,000 | 130,000 | 150 | 4,420 |
| Uinta | 32,480 | 330 | 6,496 | 160,000 | 80,000 | 80,000 | 60 | 3,910 |
| Denver-Raton Mesa | 35,770 | 560 | 7,154 | 320,000 | 90,000 | 90,000 | 70 | 2,190 |

TABLE D-15

POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASES ON NO NEW FEDERAL LEASING, HIGH LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 161,835 | 858,360 | - - | 56,925 | 1,451,030 | 319,835 | - - | 199,765 | - - | 50,125 |
| Central Appalachia | 125,350 | 692,055 | - - | 63,080 | 505,185 | 232,995 | - - | 30,430 | - - | - - |
| Southern Appalachia | 86,385 | 460,430 | - - | 35,970 | 367,490 | 311,405 | 551,925 | - - | - - | - - |
| Eastern Interior | 134,040 | 311,205 | - - | 34,660 | 4,621,535 | 1,073,920 | - - | 318,870 | - - | - - |
| Western Interior | 131,630 | 118,335 | 115,675 | 50,950 | 1,548,900 | 433,980 | 528,910 | 572,245 | - - | - - |
| Texas | 205,250 | 705,400 | 405,835 | 54,375 | - - | - - | 4,558,260 | 238,620 | - - | - - |
| Powder River | 68,345 | 20,625 | 404,620 | 3,320 | - - | - - | - - | 60,780 | 720 | 3,165 |
| Green River - Ham's Fork | 57,045 | 77,010 | 79,865 | 3,465 | 19,675 | - - | - - | 22,765 | 840 | 960 |
| Fort Union | 57,550 | 16,635 | 212,030 | 9,835 | - - | - - | - - | 320,055 | - - | 100,420 |
| San Juan | 31,740 | 116,945 | 51,310 | 2,005 | 6,320 | - - | 23,560 | 11,010 | 235 | - - |
| Uinta | 18,160 | 42,345 | 20,220 | 975 | 5,920 | - - | - - | 6,385 | 200 | - - |
| Denver-Raton Mesa | 31,990 | 54,450 | 137,080 | 7,105 | 89,190 | - - | 260 | 84,415 | 2,530 | - - |

TABLE G-16

POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON NO NEW FEDERAL LEASING, HIGH LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 161,835 | 11,330 | 40,000 | 1,620,000 | 565,000 | 405,000 | 325 | 73,895 |
| Central Appalachia | 125,350 | 8,775 | 30,000 | 1,255,000 | 440,000 | 315,000 | 250 | 57,235 |
| Southern Appalachia | 86,385 | 6,045 | 20,000 | 865,000 | 300,000 | 215,000 | 175 | 39,445 |
| Eastern Interior | 134,040 | 8,040 | 25,000 | 1,340,000 | 470,000 | 335,000 | 270 | 78,845 |
| Western Interior | 131,630 | 3,950 | 25,000 | 1,315,000 | 460,000 | 330,000 | 265 | 50,625 |
| Texas | 205,250 | 12,315 | 40,000 | 2,050,000 | 720,000 | 720,000 | 410 | 31,100 |
| Powder River | 68,345 | 2,765 | 2,050 | 615,000 | 70,000 | 170,000 | 135 | 4,410 |
| Green River - Ham's Fork | 57,045 | 1,150 | 9,127 | 3,135,000 | 145,000 | 255,000 | 115 | 6,135 |
| Fort Union | 57,550 | 2,435 | 8,057 | 520,000 | 60,000 | 145,000 | 115 | 7,020 |
| San Juan | 31,740 | 50 | 6,348 | 160,000 | 80,000 | 85,000 | 95 | 2,875 |
| Uinta | 18,160 | 180 | 3,632 | 90,000 | 45,000 | 45,000 | 35 | 2,190 |
| Denver-Raton Mesa | 31,990 | 500 | 6,400 | 290,000 | 80,000 | 85,000 | 65 | 1,965 |

TABLE G-17

POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON NO NEW FEDERAL LEASING, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 282,530 | 1,498,520 | - - | 99,380 | 2,533,700 | 558,360 | - - | 348,750 | - - | 87,500 |
| Central Appalachia | 224,110 | 1,237,320 | - - | 112,780 | 903,210 | 416,560 | - - | 54,400 | - - | - - |
| Southern Appalachia | 150,900 | 804,290 | - - | 62,840 | 641,940 | 543,970 | 964,120 | - - | - - | - - |
| Eastern Interior | 262,710 | 609,940 | - - | 67,930 | 9,057,910 | 2,104,820 | - - | 624,970 | - - | - - |
| Western Interior | 160,430 | 389,400 | 140,980 | 62,100 | 1,887,790 | 528,930 | 644,640 | 697,450 | - - | - - |
| Texas | 236,890 | 814,130 | 468,400 | 62,760 | - - | - - | 5,260,930 | 275,410 | - - | - - |
| Powder River | 84,260 | 25,420 | 498,840 | 4,090 | - - | - - | - - | 74,940 | 890 | 390 |
| Green River - Ham's Fork | 81,830 | 110,470 | 114,560 | 4,970 | 28,220 | - - | - - | 32,650 | 1,200 | 1,370 |
| Fort Union | 45,050 | 13,020 | 165,980 | 7,700 | - - | - - | - - | 250,540 | - - | 78,610 |
| San Juan | 31,000 | 114,220 | 50,110 | 1,960 | 6,170 | - - | 23,010 | 10,750 | 230 | - - |
| Uinta | 28,060 | 65,430 | 31,240 | 1,500 | 9,150 | - - | - - | 9,870 | 310 | - - |
| Denver-Raton Mesa | 30,350 | 51,660 | 130,050 | 6,740 | 84,620 | - - | 250 | 80,090 | 2,400 | - - |

TABLE G-18
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON NO NEW FEDERAL LEASING, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 282,530 | 19,780 | 70,000 | 2,830,000 | 990,000 | 710,000 | 570 | 129,000 |
| Central Appalachia | 224,110 | 15,690 | 60,000 | 2,240,000 | 780,000 | 56,000 | 450 | 102,330 |
| Southern Appalachia | 150,900 | 10,560 | 40,000 | 1,510,000 | 530,000 | 380,000 | 300 | 68,900 |
| Eastern Interior | 262,710 | 15,760 | 50,000 | 2,630,000 | 920,000 | 660,000 | 530 | 154,540 |
| Western Interior | 160,430 | 4,810 | 30,000 | 1,600,000 | 560,000 | 400,000 | 320 | 61,700 |
| Texas | 236,890 | 14,210 | 50,000 | 2,370,000 | 830,000 | 830,000 | 470 | 35,890 |
| Powder River | 84,260 | 3,410 | 2,530 | 760,000 | 80,000 | 210,000 | 170 | 5,440 |
| Green River - Ham's Fork | 81,830 | 1,650 | 13,100 | 4,500,000 | 200,000 | 370,000 | 160 | 8,800 |
| Fort Union | 45,050 | 1,900 | 6,310 | 410,000 | 50,000 | 110,000 | 90 | 5,490 |
| San Juan | 31,000 | 50 | 6,200 | 150,000 | 80,000 | 80,000 | 90 | 2,810 |
| Uinta | 28,060 | 290 | 5,615 | 140,000 | 70,000 | 70,000 | 60 | 3,380 |
| Denver-Raton Mesa | 30,350 | 480 | 6,100 | 270,000 | 80,000 | 80,000 | 60 | 1,860 |

TABLE G-19

POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON NO NEW FEDERAL LEASING, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 157,490 | 835,320 | - - | 55,395 | 1,412,075 | 311,245 | - - | 194,405 | - - | 48,780 |
| Central Appalachia | 128,105 | 707,270 | - - | 64,465 | 516,290 | 238,115 | - - | 31,095 | - - | - - |
| Southern Appalachia | 81,775 | 435,855 | - - | 34,050 | 347,880 | 294,785 | 522,470 | - - | - - | - - |
| Eastern Interior | 141,425 | 328,355 | - - | 36,570 | 4,876,160 | 113,390 | - - | 366,440 | - - | - - |
| Western Interior | 128,430 | 311,730 | 112,865 | 49,710 | 1,511,245 | 423,420 | 516,055 | 558,330 | - - | - - |
| Texas | 216,370 | 743,615 | 427,820 | 57,320 | - - | - - | 4,805,220 | 251,550 | - - | - - |
| Powder River | 62,215 | 18,770 | 368,330 | 3,020 | - - | - - | - - | 55,330 | 655 | 2,885 |
| Green River - Ham's Fork | 47,825 | 64,565 | 66,955 | 2,905 | 16,495 | - - | - - | 19,085 | 705 | 805 |
| Fort Union | 43,190 | 12,480 | 159,125 | 7,385 | - - | - - | - - | 240,195 | - - | 75,360 |
| San Juan | 24,740 | 91,155 | 39,990 | 1,560 | 4,930 | - - | 18,365 | 8,585 | 180 | - - |
| Uinta | 16,455 | 38,370 | 18,320 | 880 | 6,365 | - - | - - | 5,785 | 180 | - - |
| Denver-Raton Mesa | 30,245 | 51,480 | 129,605 | 6,720 | 84,325 | - - | 245 | 79,810 | 2,395 | - - |

TABLE G-20

POTENTIAL LOSSES TO WILDLIFE DUE TO HABITAT LOSS BASED ON NO NEW FEDERAL LEASING, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 157,490 | 11,025 | 40,000 | 1,575,000 | 550,000 | 395,000 | 315 | 72,000 |
| Central Appalachia | 128,105 | 8,965 | 30,000 | 1,280,000 | 450,000 | 320,000 | 255 | 58,000 |
| Southern Appalachia | 81,775 | 5,725 | 20,000 | 820,000 | 285,000 | 205,000 | 165 | 37,000 |
| Eastern Interior | 141,425 | 8,485 | 30,000 | 1,415,000 | 495,000 | 355,000 | 285 | 83,100 |
| Western Interior | 128,430 | 3,855 | 25,000 | 1,285,000 | 450,000 | 320,000 | 255 | 49,395 |
| Texas | 216,370 | 12,980 | 45,000 | 2,165,000 | 755,000 | 755,000 | 435 | 32,785 |
| Powder River | 62,215 | 2,515 | 1,867 | 560,000 | 60,000 | 155,000 | 125 | 4,015 |
| Green River - Ham's Fork | 47,825 | 970 | 7,652 | 2,630,000 | 120,000 | 215,000 | 95 | 5,140 |
| Fort Union | 43,190 | 1,825 | 6,047 | 390,000 | 45,000 | 110,000 | 85 | 5,265 |
| San Juan | 24,740 | 40 | 4,948 | 125,000 | 60,000 | 65,000 | 75 | 2,240 |
| Uinta | 16,455 | 165 | 3,291 | 80,000 | 40,000 | 45,000 | 35 | 1,985 |
| Denver-Raton Mesa | 30,245 | 480 | 6,049 | 270,000 | 75,000 | 80,000 | 60 | 1,855 |

TABLE G-21
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON NO NEW FEDERAL LEASING, LOW LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 287,720 | 1,526,040 | - - | 101,200 | 2,579,730 | 568,620 | - - | 355,160 | - - | 89,110 |
| Central Appalachia | 213,590 | 1,179,230 | - - | 107,490 | 860,810 | 397,010 | - - | 51,850 | - - | - - |
| Southern Appalachia | 109,950 | 586,030 | - - | 45,780 | 467,740 | 396,350 | 702,490 | - - | - - | - - |
| Eastern Interior | 260,800 | 605,510 | - - | 67,430 | 8,992,060 | 2,089,520 | - - | 620,430 | - - | - - |
| Western Interior | 136,650 | 331,690 | 120,090 | 52,890 | 1,607,970 | 450,530 | 549,080 | 594,070 | - - | - - |
| Texas | 172,330 | 592,160 | 340,680 | 45,650 | - - | - - | 3,826,500 | 200,310 | - - | - - |
| Powder River | 71,800 | 21,660 | 425,070 | 3,490 | - - | - - | - - | 63,850 | 750 | 3,330 |
| Green River - Ham's Fork | 49,920 | 67,400 | 69,890 | 3,030 | 17,220 | - - | - - | 19,920 | 730 | 840 |
| Fort Union | 43,940 | 12,700 | 161,890 | 7,510 | - - | - - | - - | 244,360 | - - | 76,670 |
| San Juan | 22,730 | 83,750 | 36,740 | 1,430 | 4,530 | - - | 16,870 | 7,890 | 170 | - - |
| Uinta | 25,500 | 5,947 | 2,839 | 1,370 | 8,310 | - - | - - | 8,970 | 280 | - - |
| Denver-Raton Mesa | 21,960 | 37,380 | 94,100 | 4,880 | 61,230 | - - | 180 | 57,950 | 1,740 | - - |

TABLE G-22
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON NO NEW FEDERAL LEASING, LOW LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 287,720 | 2,0140 | 70,000 | 2,880,000 | 1,010,000 | 720,000 | 580 | 13,100 |
| Central Appalachia | 213,590 | 14,950 | 50,000 | 2,140,000 | 750,000 | 430,000 | 530 | 97,530 |
| Southern Appalachia | 109,950 | 7,700 | 30,000 | 1,100,000 | 380,000 | 270,000 | 220 | 50,210 |
| Eastern Interior | 260,800 | 15,650 | 50,000 | 2,610,000 | 910,000 | 650,000 | 520 | 153,410 |
| Western Interior | 136,650 | 4,100 | 30,000 | 1,370,000 | 480,000 | 340,000 | 270 | 52,560 |
| Texas | 172,300 | 10,340 | 30,000 | 1,720,000 | 600,000 | 600,000 | 340 | 26,110 |
| Powder River | 71,800 | 2,900 | 2,154 | 650,000 | 70,000 | 180,000 | 140 | 4,630 |
| Green River - Ham's Fork | 49,920 | 1,010 | 7,990 | 2,750,000 | 120,000 | 220,000 | 100 | 5,370 |
| Fort Union | 43,940 | 1,860 | 6,150 | 400,000 | 40,000 | 110,000 | 90 | 5,360 |
| San Juan | 22,730 | 40 | 4,546 | 110,000 | 60,000 | 60,000 | 70 | 2,060 |
| Uinta | 25,550 | 260 | 5,100 | 130,000 | 60,000 | 70,000 | 50 | 3,070 |
| Denver-Raton Mesa | 21,960 | 340 | 4,400 | 200,000 | 50,000 | 60,000 | 40 | 1,350 |

TABLE G-23

POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON NO NEW FEDERAL LEASING, LOW LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 136,540 | 724,200 | - - | 48,025 | 1,224,235 | 269,845 | - - | 168,545 | - - | 42,290 |
| Central Appalachia | 112,355 | 620,315 | - - | 56,540 | 452,815 | 208,840 | - - | 27,275 | - - | - - |
| Southern Appalachia | 54,075 | 288,215 | - - | 22,515 | 230,040 | 194,930 | 345,495 | - - | - - | - - |
| Eastern Interior | 131,390 | 305,055 | - - | 33,975 | 4,530,165 | 1,052,690 | - - | 312,570 | - - | - - |
| Western Interior | 69,370 | 168,380 | 60,960 | 26,850 | 816,280 | 228,710 | 278,740 | 301,575 | - - | - - |
| Texas | 108,200 | 371,860 | 213,940 | 28,665 | - - | - - | 2,402,940 | 125,790 | - - | - - |
| Powder River | 42,275 | 12,755 | 250,280 | 2,050 | - - | - - | - - | 37,595 | 445 | 1,960 |
| Green River - Ham's Fork | 37,165 | 50,170 | 52,030 | 2,255 | 12,815 | - - | - - | 14,830 | 545 | 625 |
| Fort Union | 25,505 | 7,375 | 93,970 | 4,360 | - - | - - | - - | 141,840 | - - | 44,505 |
| San Juan | 17,345 | 63,910 | 28,040 | 1,095 | 3,455 | - - | 12,875 | 6,015 | 125 | - - |
| Uinta | 17,400 | 40,575 | 19,375 | 935 | 5,670 | - - | - - | 6,120 | 190 | - - |
| Denver-Raton Mesa | 17,155 | 29,200 | 73,510 | 3,810 | 47,830 | - - | 140 | 45,265 | 1,360 | - - |

TABLE G-24
POTENTIAL LOSSES TO WILDLIFE DUE TO HABITAT LOSS BASED ON NO NEW FEDERAL LEASING, LOW LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 136,540 | 9,560 | 35,000 | 1,365,000 | 480,000 | 340,000 | 275 | 62,345 |
| Central Appalachia | 112,355 | 7,865 | 30,000 | 1,125,000 | 395,000 | 280,000 | 225 | 51,305 |
| Southern Appalachia | 54,075 | 3,785 | 15,000 | 540,000 | 190,000 | 135,000 | 110 | 24,690 |
| Eastern Interior | 131,390 | 7,885 | 25,000 | 1,315,000 | 460,000 | 330,000 | 265 | 77,290 |
| Western Interior | 69,370 | 2,080 | 15,000 | 695,000 | 245,000 | 175,000 | 140 | 26,680 |
| Texas | 108,200 | 6,490 | 20,000 | 1,080,000 | 380,000 | 380,000 | 215 | 16,395 |
| Powder River | 42,275 | 1,710 | 1,269 | 380,000 | 40,000 | 105,000 | 85 | 2,725 |
| Green River - Ham's Fork | 37,165 | 755 | 5,946 | 2,045,000 | 95,000 | 165,000 | 75 | 3,995 |
| Fort Union | 25,505 | 1,080 | 3,570 | 230,000 | 25,000 | 65,000 | 50 | 3,110 |
| San Juan | 17,345 | 30 | 3,469 | 85,000 | 45,000 | 45,000 | 50 | 1,570 |
| Uinta | 17,400 | 175 | 3,480 | 85,000 | 45,000 | 45,000 | 35 | 2,095 |
| Denver-Raton Mesa | 17,155 | 270 | 3,430 | 155,000 | 45,000 | 45,000 | 35 | 1,050 |

TABLE G-25
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON PREFERENCE RIGHT LEASING, MID—LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 282,570 | 1,498,730 | - - | 99,390 | 2,533,560 | 558,440 | - - | 348,800 | - - | 87,520 |
| Central Appalachia | 224,020 | 1,236,820 | - - | 112,730 | 902,850 | 416,390 | - - | 54,380 | - - | - - |
| Southern Appalachia | 150,470 | 802,000 | - - | 62,660 | 640,120 | 542,420 | 961,370 | - - | - - | - - |
| Eastern Interior | 262,680 | 690,870 | - - | 67,920 | 9,056,880 | 2,104,580 | - - | 624,900 | - - | - - |
| Western Interior | 159,880 | 388,070 | 140,500 | 61,880 | 1,881,320 | 527,120 | 642,430 | 695,060 | - - | - - |
| Texas | 236,530 | 812,900 | 467,680 | 62,660 | - - | - - | 5,252,940 | 274,990 | - - | - - |
| Powder River | 84,310 | 25,430 | 499,140 | 4,090 | - - | - - | - - | 74,980 | 890 | 3,910 |
| Green River - Ham's Fork | 83,160 | 112,270 | 116,420 | 5,050 | 28,680 | - - | - - | 33,180 | 1,220 | 1,400 |
| Fort Union | 45,060 | 13,020 | 166,020 | 7,700 | - - | - - | - - | 250,590 | - - | 78,620 |
| San Juan | 30,930 | 113,960 | 50,000 | 1,950 | 6,160 | - - | 22,960 | 10,730 | - - | - - |
| Uinta | 28,130 | 65,600 | 31,320 | 1,510 | 9,170 | - - | - - | 9,890 | 310 | - - |
| Denver-Raton Mesa | 30,420 | 51,780 | 130,350 | 6,760 | 84,810 | - - | 250 | 80,270 | 2,410 | - - |

TABLE G-26
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON PREFERENCE RIGHT LEASING, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 282,570 | 19,780 | 70,000 | 2,830,000 | 990,000 | 710,000 | 570 | 129,030 |
| Central Appalachia | 224,020 | 15,680 | 60,000 | 2,240,000 | 780,000 | 560,000 | 450 | 102,290 |
| Southern Appalachia | 150,470 | 10,530 | 40,000 | 1,500,000 | 530,000 | 380,000 | 300 | 68,710 |
| Eastern Interior | 262,680 | 15,760 | 50,000 | 2,630,000 | 920,000 | 660,000 | 530 | 154,520 |
| Western Interior | 159,880 | 4,800 | 30,000 | 1,600,000 | 560,000 | 400,000 | 320 | 61,490 |
| Texas | 336,530 | 14,190 | 50,000 | 2,370,000 | 830,000 | 830,000 | 470 | 35,840 |
| Powder River | 84,310 | 3,410 | 2,530 | 760,000 | 80,000 | 210,000 | 170 | 5,440 |
| Green River - Ham's Fork | 83,160 | 1,690 | 13,310 | 4,570,000 | 210,000 | 370,000 | 170 | 8,940 |
| Fort Union | 45,060 | 1,900 | 6,310 | 410,000 | 50,000 | 110,000 | 90 | 550 |
| San Juan | 30,930 | 50 | 6,190 | 150,000 | 80,000 | 80,000 | 90 | 2,800 |
| Uinta | 28,130 | 290 | 5,630 | 140,000 | 70,000 | 70,000 | 60 | 3,390 |
| Denver-Raton Mesa | 30,420 | 480 | 6,100 | 270,000 | 80,000 | 80,000 | 60 | 1,870 |

TABLE G-27
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON PREFERENCE RIGHT LEASING, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 157,455 | 835,130 | - - | 55,385 | 1,411,760 | 311,180 | - - | 194,360 | - - | 48,765 |
| Central Appalachia | 129,055 | 712,510 | - - | 64,945 | 520,120 | 239,880 | - - | 31,330 | - - | - - |
| Southern Appalachia | 82,445 | 406,260 | - - | 34,330 | 350,730 | 297,200 | 526,750 | - - | - - | - - |
| Eastern Interior | 140,640 | 190,475 | - - | 36,365 | 4,849,095 | 1,126,800 | - - | 334,575 | - - | - - |
| Western Interior | 126,810 | 307,800 | 111,440 | 49,085 | 1,492,185 | 418,090 | 509,545 | 551,290 | - - | - - |
| Texas | 215,070 | 739,150 | 425,250 | 56,980 | - - | - - | 4,776,345 | 250,040 | - - | - - |
| Powder River | 69,950 | 21,105 | 414,120 | 3,395 | - - | - - | - - | 62,210 | 735 | 3,240 |
| Green River - Ham's Fork | 48,735 | 65,790 | 68,230 | 2,960 | 16,810 | - - | - - | 19,445 | 715 | 820 |
| Fort Union | 42,035 | 12,145 | 154,870 | 7,185 | - - | - - | - - | 233,770 | - - | 73,345 |
| San Juan | 23,065 | 84,985 | 37,285 | 1,455 | 4,595 | - - | 17,120 | 8,000 | 170 | - - |
| Uinta | 16,280 | 37,965 | 18,125 | 875 | 5,305 | - - | - - | 5,725 | 180 | - - |
| Denver-Raton Mesa | 30,370 | 51,695 | 130,140 | 6,745 | 84,675 | - - | 245 | 80,140 | 2,405 | - - |

TABLE G-28
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON
PREFERENCE RIGHT LEASING, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 157,455 | 11,020 | 40,000 | 1,575,000 | 550,000 | 395,000 | 315 | 71,895 |
| Central Appalachia | 129,055 | 9,035 | 30,000 | 1,290,000 | 450,000 | 325,000 | 260 | 58,930 |
| Southern Appalachia | 82,445 | 5,770 | 20,000 | 825,000 | 290,000 | 205,000 | 165 | 37,645 |
| Eastern Interior | 140,640 | 8,440 | 30,000 | 1,405,000 | 490,000 | 350,000 | 280 | 82,730 |
| Western Interior | 126,810 | 3,805 | 25,000 | 1,270,000 | 445,000 | 315,000 | 255 | 48,775 |
| Texas | 215,070 | 12,905 | 45,000 | 2,150,000 | 755,000 | 755,000 | 430 | 32,585 |
| Powder River | 69,950 | 2,830 | 2,100 | 630,000 | 70,000 | 175,000 | 140 | 4,515 |
| Green River - Ham's Fork | 48,735 | 985 | 7,780 | 2,680,000 | 120,000 | 220,000 | 95 | 5,240 |
| Fort Union | 42,035 | 1,780 | 5,890 | 380,000 | 40,000 | 105,000 | 85 | 5,125 |
| San Juan | 23,065 | 35 | 4,615 | 115,000 | 60,0-0 | 60,000 | 70 | 2,090 |
| Uinta | 16,280 | 160 | 3,256 | 80,000 | 40,000 | 40,000 | 35 | 1,960 |
| Denver-Raton Mesa | 30,370 | 480 | 6,074 | 275,000 | 75,000 | 80,000 | 60 | 1,865 |

TABLE G-29
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON SHORT-TERM LEASING, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 282,520 | 1,498,470 | - - | 99,370 | 2,533,110 | 558,340 | - - | 348,740 | - - | 87,500 |
| Central Appalachia | 223,650 | 2,733,240 | - - | 112,550 | 901,360 | 415,710 | - - | 54,290 | - - | - - |
| Southern Appalachia | 150,640 | 80,290 | - - | 62,730 | 640,840 | 543,030 | 962,460 | - - | - - | - - |
| Eastern Interior | 263,220 | 141,403 | - - | 68,060 | 9,075,500 | 2,108,910 | - - | 626,180 | - - | - - |
| Western Interior | 161,030 | 390,860 | 141,510 | 62,330 | 1,894,850 | 530,910 | 647,050 | 700,050 | - - | - - |
| Texas | 237,930 | 817,710 | 470,450 | 63,030 | - - | - - | 5,284,030 | 276,620 | - - | - - |
| Powder River | 84,370 | 25,460 | 499,490 | 4,100 | - - | - - | - - | 75,030 | 890 | 3,910 |
| Green River - Ham's Fork | 82,880 | 111,890 | 116,030 | 5,030 | 28,580 | - - | - - | 33,070 | 1,220 | 1,390 |
| Fort Union | 45,060 | 13,020 | 166,020 | 7,700 | - - | - - | - - | 250,590 | - - | 78,620 |
| San Juan | 30,930 | 113,960 | 50,000 | 1,950 | 6,160 | - - | 22,960 | 10,730 | 230 | - - |
| Uinta | 28,220 | 65,810 | 31,420 | 1,510 | 9,200 | - - | - - | 9,920 | 310 | - - |
| Denver-Raton Mesa | 30,420 | 51,780 | 130,350 | 6,760 | 84,810 | - - | 250 | 80,270 | 2,410 | - - |

TABLE G-30
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON SHORT-TERM LEASING, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 282,520 | 19,780 | 70,000 | 2,830,000 | 990,000 | 710,000 | 570 | 129,000 |
| Central Appalachia | 223,650 | 15,660 | 60,000 | 2,240,000 | 780,000 | 560,000 | 450 | 102,120 |
| Southern Appalachia | 150,640 | 10,540 | 40,000 | 151,000 | 530,000 | 380,000 | 300 | 68,790 |
| Eastern Interior | 263,220 | 15,790 | 50,000 | 2,630,000 | 920,000 | 660,000 | 530 | 154,840 |
| Western Interior | 161,030 | 483 | 30,000 | 1,610,000 | 560,000 | 400,000 | 320 | 61,930 |
| Texas | 237,930 | 1,428 | 50,000 | 2,380,000 | 830,000 | 830,000 | 480 | 36,050 |
| Powder River | 84,370 | 3,410 | 2,531 | 760,000 | 80,000 | 210,000 | 170 | 5,440 |
| Green River - Ham's Fork | 82,880 | 1,180 | 13,260 | 4,560,000 | 210,000 | 370,000 | 170 | 8,910 |
| Fort Union | 45,060 | 1,900 | 6,308 | 410,000 | 50,000 | 110,000 | 90 | 5,500 |
| San Juan | 30,930 | 50 | 8,460 | 150,000 | 80,000 | 80,000 | 90 | 2,800 |
| Uinta | 28,220 | 290 | 5,650 | 140,000 | 70,000 | 70,000 | 60 | 3,400 |
| Denver-Raton Mesa | 30,420 | 480 | 6,084 | 270,000 | 80,000 | 80,000 | 60 | 1,870 |

TABLE G-31
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON SHORT-TERM LEASING, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 157,490 | 835,320 | - - | 55,395 | 1,412,075 | 311,245 | - - | 194,405 | - - | 48,780 |
| Central Appalachia | 127,920 | 706,250 | - - | 64,375 | 515,545 | 237,770 | - - | 31,005 | - - | - - |
| Southern Appalachia | 81,785 | 435,910 | - - | 34,055 | 347,920 | 294,820 | 522,535 | - - | - - | - - |
| Eastern Interior | 141,020 | 327,410 | - - | 36,465 | 4,862,195 | 1,129,845 | - - | 335,475 | - - | - - |
| Western Interior | 128,600 | 312,145 | 113,010 | 49,775 | 1,513,245 | 423,990 | 516,735 | 559,070 | - - | - - |
| Texas | 215,275 | 739,850 | 425,655 | 57,030 | - - | - - | 4,780,900 | 250,275 | - - | - - |
| Powder River | 63,970 | 19,300 | 378,720 | 3,105 | - - | - - | - - | 56,890 | 670 | 2,965 |
| Green River - Ham's Fork | 50,065 | 67,590 | 70,090 | 3,040 | 17,265 | - - | - - | 19,980 | 735 | 840 |
| Fort Union | 43,130 | 12,465 | 158,905 | 7,370 | - - | - - | - - | 239,860 | - - | 75,255 |
| San Juan | 24,370 | 89,790 | 39,395 | 1,540 | 4,855 | - - | 18,090 | 8,455 | 180 | - - |
| Uinta | 16,555 | 38,605 | 18,430 | 885 | 5,395 | - - | - - | 5,820 | 180 | - - |
| Denver-Raton Mesa | 30,350 | 51,660 | 130,055 | 6,740 | 84,620 | - - | 245 | 80,085 | 2,400 | - - |

TABLE G-32
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON SHORT-TERM LEASING, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 157,490 | 11,025 | 40,000 | 1,575,000 | 550,000 | 395,000 | 315 | 71,915 |
| Central Appalachia | 127,920 | 8,955 | 30,000 | 1,280,000 | [illegible] | 320,000 | 255 | 58,410 |
| Southern Appalachia | 81,785 | 5,725 | 20,000 | 820,000 | 285,000 | 205,000 | 165 | 37,345 |
| Eastern Interior | 141,020 | 8,460 | 30,000 | 1,410,000 | 495,000 | 355,000 | 280 | 82,955 |
| Western Interior | 128,600 | 3,860 | 25,000 | 1,285,000 | 450,000 | 320,000 | 255 | 49,460 |
| Texas | 215,275 | 12,915 | 45,000 | 2,155,000 | 755,000 | 755,000 | 430 | 32,615 |
| Powder River | 63,970 | 2,590 | 1,919 | 575,000 | 65,000 | 160,000 | 130 | 4,125 |
| Green River - Ham's Fork | 50,065 | 1,015 | 8,010 | 655,000 | 30,000 | 55,000 | 25 | 5,385 |
| Fort Union | 43,130 | 1,825 | 6,040 | 390,000 | 45,000 | 110,000 | 85 | 5,260 |
| San Juan | 24,370 | 40 | 4,874 | 120,000 | 60,000 | 65,000 | 75 | 2,205 |
| Uinta | 16,555 | 165 | 3,310 | 85,000 | 40,000 | 45,000 | 35 | 1,995 |
| Denver-Raton Mesa | 30,350 | 480 | 6,070 | 275,000 | 75,000 | 80,000 | 60 | 1,860 |

TABLE G-33
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON LEASING TO SATISFY INDUSTRY NEEDS, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 282,070 | 1,496,080 | - | 99,210 | 2,529,070 | 557,450 | - | 348,180 | - | 87,360 |
| Central Appalachia | 218,150 | 1,204,410 | - | 109,780 | 879,190 | 405,480 | - | 52,950 | - | - |
| Southern Appalachia | 152,360 | 812,070 | - | 63,440 | 648,160 | 549,230 | 973,450 | - | - | - |
| Eastern Interior | 261,170 | 606,360 | - | 67,530 | 9,004,820 | 2,092,480 | - | 621,310 | - | - |
| Western Interior | 158,710 | 385,230 | 139,470 | 61,430 | 1,867,550 | 523,260 | 637,720 | 689,970 | - | - |
| Texas | 224,850 | 772,760 | 444,590 | 59,570 | - | - | 4,993,540 | 261,410 | - | - |
| Powder River | 91,110 | 27,490 | 539,390 | 4,420 | - | - | - | 81,030 | 960 | 4,220 |
| Green River - Ham's Fork | 111,740 | 150,840 | 156,440 | 6,780 | 38,540 | - | - | 44,590 | 1,640 | 1,880 |
| Fort Union | 49,410 | 14,280 | 182,040 | 8,450 | - | - | - | 274,780 | - | 86,210 |
| San Juan | 35,080 | 129,250 | 56,710 | 2,210 | 6,990 | - | 26,040 | 12,170 | 260 | - |
| Uinta | 29,780 | 69,450 | 33,160 | 1,600 | 9,710 | - | - | 10,470 | 330 | - |
| Denver-Raton Mesa | 33,670 | 57,310 | 144,280 | 7,480 | 93,870 | - | 270 | 88,850 | 2,660 | - |

TABLE G-34
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON LEASING TO SATISFY INDUSTRY NEEDS, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 282,070 | 19,740 | 70,000 | 2,820,000 | 990,000 | 710,000 | 560 | 128,800 |
| Central Appalachia | 218,150 | 15,270 | 50,000 | 2,180,000 | 760,000 | 550,000 | 440 | 99,610 |
| Southern Appalachia | 152,360 | 10,670 | 40,000 | 1,520,000 | 530,000 | 380,000 | 300 | 69,570 |
| Eastern Interior | 261,170 | 15,670 | 50,000 | 2,610,000 | 910,000 | 650,000 | 520 | 153,630 |
| Western Interior | 158,710 | 4,760 | 30,000 | 1,590,000 | 560,000 | 400,000 | 320 | 61,040 |
| Texas | 224,850 | 13,490 | 40,000 | 2,250,000 | 790,000 | 790,000 | 450 | 34,070 |
| Powder River | 91,110 | 3,680 | 2,733 | 820,000 | 90,000 | 230,000 | 180 | 5,880 |
| Green River - Ham's Fork | 111,740 | 2,260 | 17,878 | 6,150,000 | 280,000 | 50,000 | 220 | 12,020 |
| Fort Union | 49,410 | 2,080 | 6,917 | 440,000 | 50,000 | 120,000 | 100 | 6,030 |
| San Juan | 35,080 | 60 | 7,016 | 180,000 | 90,000 | 90,000 | 110 | 3,180 |
| Uinta | 29,780 | 300 | 5,956 | 150,000 | 70,000 | 80,000 | 60 | 3,590 |
| Denver-Raton Mesa | 33,670 | 540 | 6,734 | 300,000 | 80,000 | 90,000 | 70 | 2,070 |

TABLE G-35
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON LEASING TO SATISFY INDUSTRY NEED, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 157,215 | 800,505 | - | 55,300 | 1,409,610 | 306,205 | - | 194,065 | - | 48,690 |
| Central Appalachia | 127,730 | 705,200 | - | 64,280 | 514,780 | 237,415 | - | 31,005 | - | - |
| Southern Appalachia | 82,890 | 441,800 | - | 34,515 | 352,625 | 298,805 | 529,595 | - | - | - |
| Eastern Interior | 135,795 | 315,280 | - | 35,110 | 4,682,045 | 1,087,985 | - | 323,045 | - | - |
| Western Interior | 129,605 | 314,590 | 113,895 | 50,165 | 1,525,070 | 427,305 | 520,775 | 563,440 | - | - |
| Texas | 192,620 | 661,995 | 380,860 | 51,030 | - | - | 4,277,770 | 223,940 | - | - |
| Powder River | 84,970 | 25,635 | 503,045 | 4,125 | - | - | - | 75,565 | 895 | 3,935 |
| Green River - Ham's Fork | 69,550 | 93,890 | 97,370 | 4,225 | 23,985 | - | - | 27,755 | 1,025 | 1,170 |
| Fort Union | 44,750 | 12,935 | 164,875 | 7,650 | - | - | - | 248,870 | - | 78,085 |
| San Juan | 25,110 | 91,120 | 40,590 | 1,585 | 5,000 | - | 18,640 | 8,710 | 185 | - |
| Uinta | 17,745 | 41,385 | 19,755 | 950 | 5,785 | - | - | 6,240 | 195 | - |
| Denver-Raton Mesa | 32,160 | 54,740 | 137,810 | 7,145 | 89,665 | - | 260 | 84,860 | 2,545 | - |

TABLE G-36

POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON LEASING TO SATISFY INDUSTRY NEEDS, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 157,215 | 11,005 | 40,000 | 1,570,000 | 550,000 | 395,000 | 315 | 71,290 |
| Central Appalachia | 127,730 | 8,940 | 30,000 | 1,275,000 | 445,000 | 320,000 | 255 | 58,325 |
| Southern Appalachia | 82,890 | 5,800 | 20,000 | 830,000 | 290,000 | 205,000 | 165 | 37,850 |
| Eastern Interior | 135,795 | 8,150 | 25,000 | 1,360,000 | 475,000 | 340,000 | 270 | 78,880 |
| Western Interior | 129,605 | 3,890 | 25,000 | 1,295,000 | 455,000 | 325,000 | 260 | 49,850 |
| Texas | 192,620 | 11,555 | 40,000 | 1,925,000 | 675,000 | 675,000 | 385 | 29,185 |
| Powder River | 84,970 | 3,440 | 2,550 | 765,000 | 85,000 | 210,00 | 170 | 5,480 |
| Green River - Ham's Fork | 69,550 | 1,385 | 11,130 | 3,825,000 | 175,000 | 315,000 | 140 | 7,480 |
| Fort Union | 44,750 | 1,890 | 6,265 | 405,000 | 45,000 | 110,000 | 90 | 5,455 |
| San Juan | 25,110 | 40 | 5,020 | 125,000 | 65,000 | 65,000 | 75 | 2,275 |
| Uinta | 17,745 | 175 | 3,550 | 900,000 | 45,000 | 45,000 | 35 | 2,140 |
| Denver-Raton Mesa | 32,160 | 510 | 6,430 | 290,000 | 80,000 | 85,000 | 75 | 1,975 |

TABLE G-37
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON STATE DETERMINATION, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 282,300 | 149,730 | - | 99,300 | 2,531,140 | 557,910 | - | 348,470 | - | 87,430 |
| Central Appalachia | 226,260 | 124,919 | - | 113,860 | 911,870 | 420,560 | - | 54,920 | - | - |
| Southern Appalachia | 148,290 | 790,380 | - | 61,750 | 630,840 | 534,560 | 947,450 | - | - | - |
| Eastern Interior | 264,290 | 613,610 | - | 68,340 | 9,112,390 | 2,117,480 | - | 628,730 | - | - |
| Western Interior | 192,620 | 467,540 | 169,270 | 74,560 | 2,266,570 | 635,060 | 773,980 | 837,390 | - | - |
| Texas | 253,790 | 872,210 | 501,810 | 67,240 | - | - | 5,636,250 | 295,050 | - | - |
| Powder River | 77,690 | 23,440 | 459,940 | 3,770 | - | - | - | 69,090 | 820 | 3,600 |
| Green River - Ham's Fork | 67,540 | 91,180 | 94,560 | 4,100 | 23,290 | - | - | 26,950 | 990 | 1,130 |
| Fort Union | 49,770 | 14,380 | 183,370 | 8,510 | - | - | - | 276,790 | - | 86,840 |
| San Juan | 36,770 | 135,480 | 59,440 | 2,320 | 7,320 | - | 27,290 | 12,760 | 270 | - |
| Uinta | 28,500 | 66,460 | 31,730 | 1,530 | 9,290 | - | - | 10,020 | 310 | - |
| Denver-Raton Mesa | 31,040 | 52,830 | 133,010 | 6,890 | 86,540 | - | 250 | 81,910 | 2,460 | - |

TABLE G-38
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON STATE DETERMINATION, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 282,300 | 19,760 | 70,000 | 2,820,000 | 990,000 | 71,000 | 560 | 129,000 |
| Central Appalachia | 226,260 | 15,846 | 60,000 | 2,260,000 | 790,000 | 570,000 | 450 | 103,000 |
| Southern Appalachia | 148,290 | 10,380 | 40,000 | 1,480,000 | 520,000 | 370,000 | 300 | 67,700 |
| Eastern Interior | 264,290 | 15,860 | 50,000 | 2,640,000 | 930,000 | 660,000 | 530 | 155,000 |
| Western Interior | 192,620 | 5,780 | 40,000 | 1,930,000 | 670,000 | 480,000 | 390 | 74,000 |
| Texas | 253,790 | 15,230 | 50,000 | 2,540,000 | 890,000 | 890,000 | 510 | 38,000 |
| Powder River | 77,690 | 314 | 2,330 | 700,000 | 80,000 | 190,000 | 160 | 5,010 |
| Green River - Ham's Fork | 67,540 | 1,380 | 10,800 | 3,710,000 | 170,000 | 30,000 | 140 | 7,200 |
| Fort Union | 49,770 | 2,110 | 6,968 | 450,000 | 50,000 | 120,000 | 100 | 6,070 |
| San Juan | 36,770 | 60 | 7,354 | 180,000 | 90,000 | 100,000 | 110 | 3,330 |
| Uinta | 28,500 | 290 | 5,700 | 140,000 | 70,000 | 70,000 | 60 | 3,430 |
| Denver-Raton Mesa | 31,040 | 480 | 6,200 | 280,000 | 80,000 | 80,000 | 60 | 1,900 |

TABLE G-39
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON STATE DETERMINATION, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 158,345 | 839,850 | - | 55,695 | 1,419,740 | 312,935 | - | 195,460 | - | 49,040 |
| Central Appalachia | 129,185 | 713,235 | - | 65,010 | 520,640 | 240,120 | - | 31,360 | - | - |
| Southern Appalachia | 78,290 | 417,285 | - | 32,600 | 333,055 | 282,220 | 500,205 | - | - | - |
| Eastern Interior | 147,590 | 342,665 | - | 38,160 | 5,088,720 | 1,182,485 | - | 351,105 | - | - |
| Western Interior | 127,780 | 310,160 | 112,290 | 49,460 | 1,503,595 | 421,285 | 513,445 | 555,505 | - | - |
| Texas | 213,410 | 733,440 | 421,970 | 56,540 | - | - | 4,739,480 | 248,110 | - | - |
| Powder River | 56,830 | 27,440 | 336,450 | 2,760 | - | - | - | 50,540 | 595 | 2,635 |
| Green River - Ham's Fork | 33,600 | 45,360 | 47,040 | 2,040 | 11,590 | - | - | 13,410 | 495 | 565 |
| Fort Union | 44,390 | 12,830 | 163,545 | 7,590 | - | - | - | 246,865 | - | 77,455 |
| San Juan | 26,295 | 19,377 | 42,505 | 1,660 | 5,235 | - | 19,520 | 9,120 | 195 | - |
| Uinta | 16,215 | 37,815 | 18,055 | 870 | 5,285 | - | - | 5,700 | 180 | |
| Denver-Raton Mesa | 29,295 | 49,865 | 125,530 | 6,505 | 81,675 | - | 235 | 77,300 | 2,320 | - |

TABLE G-40
POTENTIAL LOSS OF WILDLIFE DUE TO HABITAT LOSS BASED ON STATE DETERMINATION, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 158,345 | 11,085 | 40,000 | 1,585,000 | 555,000 | 395,000 | 315 | 72,000 |
| Central Appalachia | 129,185 | 9,045 | 30,000 | 1,290,000 | 450,000 | 325,000 | 260 | 59,000 |
| Southern Appalachia | 78,290 | 5,480 | 20,000 | 785,000 | 275,000 | 195,000 | 155 | 35,750 |
| Eastern Interior | 147,590 | 8,855 | 30,000 | 1,475,000 | 515,000 | 370,000 | 295 | 86,820 |
| Western Interior | 127,780 | 3,835 | 25,000 | 1,280,000 | 445,000 | 320,000 | 255 | 49,145 |
| Texas | 213,410 | 12,805 | 45,000 | 2,135,000 | 745,000 | 745,000 | 425 | 32,335 |
| Powder River | 56,830 | 2,300 | 1,705 | 510,000 | 55,000 | 140,000 | 115 | 3,665 |
| Green River - Ham's Fork | 33,600 | 1,360 | 5,376 | 1,850,000 | 85,000 | 150,000 | 65 | 3,615 |
| Fort Union | 44,390 | 1,875 | 6,215 | 400,000 | 45,000 | 110,000 | 90 | 5,415 |
| San Juan | 26,295 | 40 | 5,260 | 130,000 | 65,000 | 70,000 | 80 | 2,380 |
| Uinta | 16,215 | 160 | 3,243 | 80,000 | 40,000 | 40,000 | 30 | 1,955 |
| Denver-Raton Mesa | 29,295 | 460 | 5,859 | 265,000 | 75,000 | 75,000 | 60 | 1,800 |

TABLE G-41
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON DEPARTMENT OF ENERGY GOALS, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 258,510 | 1,371,110 | - - | 90,930 | 2,317,830 | 510,890 | - - | 319,100 | - - | 80,070 |
| Central Appalachia | 152,810 | 843,660 | - - | 76,900 | 615,860 | 284,030 | - - | 37,090 | - - | - - |
| Southern Appalachia | 145,150 | 773,640 | - - | 60,440 | 617,480 | 523,240 | 927,380 | - - | - - | - - |
| Eastern Interior | 256,790 | 596,200 | - - | 66,400 | 8,853,800 | 2,057,390 | - - | 610,890 | - - | - - |
| Western Interior | 168,580 | 409,190 | 148,150 | 65,250 | 1,983,690 | 555,800 | 677,380 | 732,880 | - - | - - |
| Texas | 231,510 | 795,650 | 457,760 | 61,330 | - - | - - | 5,141,450 | 269,150 | - - | - - |
| Powder River | 81,740 | 24,670 | 483,920 | 3,970 | - - | - - | - - | 72,690 | 860 | 3,790 |
| Green River - Ham's Fork | 113,550 | 182,490 | 158,970 | 6,890 | 39,160 | - - | - - | 45,310 | 1,670 | 1,910 |
| Fort Union | 37,140 | 10,730 | 136,840 | 6,350 | - - | - - | - - | 206,550 | - - | 64,800 |
| San Juan | 30,070 | 110,790 | 48,610 | 1,900 | 5,990 | - - | 22,320 | 10,430 | 220 | - - |
| Uinta | 28,080 | 65,480 | 31,260 | 1,510 | 9,150 | - - | - - | 9,870 | 310 | - - |
| Denver-Raton Mesa | 33,650 | 57,280 | 144,190 | 7,470 | 93,820 | - - | 270 | 88,790 | 2,660 | - - |

TABLE G-42

POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON DEPARTMENT OF ENERGY COALS, MID-LEVEL COAL PRODUCTION, 1976-1985

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 258,510 | 18,100 | 60,000 | 2,590,000 | 900,000 | 650,000 | 520 | 118,040 |
| Central Appalachia | 152,810 | 10,700 | 40,000 | 1,530,000 | 530,000 | 380,000 | 310 | 61,780 |
| Southern Appalachia | 145,150 | 10,160 | 40,000 | 1,450,000 | 510,000 | 360,000 | 290 | 66,280 |
| Eastern Interior | 256,790 | 15,410 | 50,000 | 2,570,000 | 900,000 | 640,000 | 510 | 151,050 |
| Western Interior | 168,580 | 5,060 | 30,000 | 1,690,000 | 590,000 | 420,000 | 340 | 64,840 |
| Texas | 231,510 | 13,890 | 50,000 | 2,320,000 | 810,000 | 810,000 | 460 | 35,080 |
| Powder River | 81,740 | 3,310 | 2,452 | 740,000 | 80,000 | 200,000 | 160 | 5,240 |
| Green River - Ham's Fork | 113,550 | 2,300 | 18,168 | 6,250,000 | 280,000 | 510,000 | 230 | 12,210 |
| Fort Union | 37,140 | 1,570 | 5,186 | 330,000 | 40,000 | 90,000 | 70 | 4,530 |
| San Juan | 30,070 | 50 | 6,014 | 150,000 | 80,000 | 80,000 | 90 | 2,720 |
| Uinta | 28,080 | 290 | 5,616 | 140,000 | 70,000 | 70,000 | 60 | 3,380 |
| Denver-Raton Mesa | 33,650 | 520 | 6,730 | 300,000 | 80,000 | 90,000 | 70 | 2,060 |

TABLE G-43
POTENTIAL LOSSES TO NATURAL AND AGRICULTURAL PRODUCTION BASED ON DEPARTMENT OF ENERGY GOALS, MID-LEVEL COAL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | POTENTIAL PRODUCTIVITY LOSS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Forest (tons) | Range (tons) | Pasture (tons) | Corn (bu) | Soybeans (bu) | Cotton (tons) | Wheat (bu) | Sugarbeets (tons) | Oats (bu) |
| Northern Appalachia | 134,750 | 714,705 | | 47,395 | 1,208,185 | 266,305 | | 166,335 | | 41,735 |
| Central Appalachia | 103,665 | 572,335 | - - | 52,165 | 417,790 | 192,685 | - - | 25,165 | - - | - - |
| Southern Appalachia | 78,360 | 417,655 | - - | 32,630 | 333,350 | 282,475 | 500,655 | - - | - - | - - |
| Eastern Interior | 137,640 | 319,560 | - - | 35,590 | 4,745,660 | 1,102,765 | - - | 327,435 | - - | - - |
| Western Interior | 114,045 | 276,820 | 100,200 | 44,145 | 1,341,975 | 376,000 | 458,255 | 495,795 | - - | - - |
| Texas | 201,000 | 690,790 | 397,430 | 53,250 | - - | - - | 4,463,875 | 233,680 | - - | - - |
| Powder River | 73,395 | 22,145 | 434,515 | 3,565 | - - | - - | - - | 65,270 | 770 | 3,400 |
| Green River - Ham's Fork | 68,955 | 93,090 | 96,535 | 4,185 | 23,780 | - - | - - | 27,515 | 1,015 | 1,160 |
| Fort Union | 34,835 | 10,070 | 128,345 | 5,955 | - - | - - | - - | 193,745 | - - | 60,785 |
| San Juan | 33,090 | 121,920 | 53,490 | 2,090 | 6,590 | - - | 24,560 | 11,480 | 245 | - - |
| Uinta | 16,420 | 38,290 | 18,280 | 880 | 5,350 | - - | - - | 5,775 | 180 | - - |
| Denver-Raton Mesa | 22,955 | 39,070 | 98,365 | 5,100 | 64,000 | - - | 185 | 60,570 | 1,815 | - - |

TABLE G-44
POTENTIAL LOSSES OF WILDLIFE DUE TO HABITAT LOSS BASED ON DEPARTMENT OF ENERGY COALS, MID-LEVEL PRODUCTION, 1986-1990

| Region | Total Land Committed (acres) | Potential Wildlife Losses | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Game Mammals | Game Birds | Small Mammals | Birds | Amphibians/ Reptiles | Predators | Animal Units |
| Northern Appalachia | 134,750 | 9,430 | 35,000 | 1,345,000 | 470,000 | 335,000 | 270 | 61,500 |
| Central Appalachia | 103,665 | 7,255 | 25,000 | 1,035,000 | 365,000 | 260,000 | 205 | 47,000 |
| Southern Appalachia | 78,360 | 5,485 | 20,000 | 785,000 | 275,000 | 195,000 | 155 | 35,800 |
| Eastern Interior | 137,640 | 8,260 | 30,000 | 1,375,000 | 480,000 | 345,000 | 275 | 81,000 |
| Western Interior | 114,045 | 3,420 | 25,000 | 1,140,000 | 400,000 | 285,000 | 230 | 44,000 |
| Texas | 201,000 | 12,060 | 40,000 | 2,010,000 | 705,000 | 705,000 | 400 | 31,000 |
| Powder River | 73,395 | 2,970 | 2,202 | 660,000 | 75,000 | 185,000 | 145 | 4,800 |
| Green River - Ham's Fork | 68,955 | 1,400 | 10,000 | 3,795,000 | 170,000 | 310,000 | 140 | 7,500 |
| Fort Union | 34,835 | 1,475 | 5,000 | 315;000 | 35,000 | 85,000 | 70 | 4,300 |
| San Juan | 33,090 | 55 | 5,000 | 165,000 | 85,000 | 85,000 | 100 | 3,000 |
| Uinta | 16,420 | 165 | 5,000 | 80,000 | 40,000 | 45,000 | 35 | 2,000 |
| Denver-Raton Mesa | 22,955 | 360 | 5,000 | 205,000 | 55,000 | 60,000 | 45 | 1,500 |

# APPENDIX H

## COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE PREFFERED ALTERNATIVE HIGH LEVEL 1985-1976

TABLE II-1. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE HIGH LEVEL 1985-1996

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 74659 | 16425 | 883 | 75 | 373 | 24861 | 9 | 6 | 194 | 159 | 149 |
| Arizona | 23781 | 5232 | 281 | 24 | 119 | 7913 | 3 | 2 | 62 | 50 | 48 |
| Arkansas | 57054 | 12552 | 675 | 57 | 285 | 18991 | 7 | 5 | 148 | 120 | 114 |
| Colorado | 47165 | 10376 | 558 | 47 | 236 | 15706 | 6 | 4 | 123 | 99 | 94 |
| Georgia | 36026 | 7926 | 426 | 36 | 180 | 11997 | 4 | 3 | 94 | 76 | 72 |
| Idaho | 9147 | 2013 | 108 | 9 | 46 | 3047 | 1 | 1 | 24 | 19 | 18 |
| Illinois | 87710 | 19296 | 1037 | 88 | 439 | 29207 | 11 | 7 | 228 | 184 | 175 |
| Indiana | 28198 | 6204 | 334 | 28 | 141 | 9390 | 3 | 2 | 73 | 59 | 56 |
| Iowa | 15433 | 3395 | 183 | 15 | 77 | 5139 | 2 | 1 | 40 | 32 | 31 |
| Kansas | 4131 | 909 | 49 | 4 | 21 | 1376 | 0 | 0 | 11 | 9 | 8 |
| Kentucky | 21802 | 4797 | 258 | 22 | 109 | 7260 | 3 | 2 | 57 | 46 | 44 |
| Louisiana | 1958 | 431 | 23 | 2 | 10 | 652 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 27234 | 5991 | 322 | 27 | 136 | 9069 | 3 | 2 | 71 | 57 | 54 |
| Missouri | 14581 | 3208 | 172 | 15 | 73 | 4855 | 2 | 1 | 38 | 31 | 29 |
| Montana | 73874 | 16232 | 862 | 73 | 364 | 24267 | 9 | 6 | 189 | 153 | 146 |
| Nebraska | 33232 | 7311 | 393 | 33 | 166 | 11066 | 4 | 3 | 86 | 70 | 66 |
| New Mexico | 33160 | 7295 | 392 | 33 | 166 | 11042 | 4 | 3 | 86 | 70 | 66 |
| North Dakota | 40943 | 9007 | 484 | 41 | 205 | 13634 | 5 | 3 | 106 | 86 | 82 |
| Ohio | 42746 | 9405 | 506 | 43 | 214 | 14235 | 5 | 4 | 111 | 90 | 86 |
| Oklahoma | 5376 | 1187 | 64 | 5 | 27 | 1797 | 1 | 0 | 14 | 11 | 11 |
| Pennsylvania | 122787 | 27013 | 1452 | 123 | 614 | 40888 | 15 | 10 | 319 | 258 | 246 |
| South Dakota | 10375 | 2283 | 123 | 10 | 52 | 3456 | 1 | 1 | 27 | 22 | 21 |
| Tennessee | -3784 | -833 | -45 | -4 | -19 | -1260 | 0 | 0 | -10 | -8 | -8 |
| Texas | 144835 | 31864 | 1713 | 145 | 724 | 48230 | 17 | 12 | 377 | 304 | 290 |
| Utah | 63378 | 13943 | 750 | 63 | 317 | 21105 | 8 | 5 | 165 | 133 | 127 |
| Virginia | 28647 | 6307 | 339 | 29 | 143 | 9546 | 3 | 2 | 75 | 60 | 57 |
| West Virginia | 2718 | 598 | 32 | 3 | 14 | 905 | 0 | 0 | 7 | 6 | 5 |
| Wyoming | 159773 | 35150 | 1890 | 160 | 799 | 53204 | 19 | 14 | 415 | 336 | 320 |

TABLE H-2. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE HIGH LEVEL 1990-1995

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 41851 | 9207 | 495 | 42 | 209 | 13936 | 5 | 4 | 109 | 88 | 84 |
| Arizona | 43161 | 7495 | 511 | 43 | 216 | 14173 | 5 | 4 | 112 | 91 | 86 |
| Arkansas | 142091 | 31360 | 1681 | 142 | 710 | 47316 | 17 | 12 | 369 | 298 | 284 |
| Colorado | 71922 | 20123 | 1087 | 92 | 460 | 30610 | 11 | 8 | 239 | 193 | 184 |
| Georgia | 61848 | 13606 | 732 | 62 | 309 | 20595 | 7 | 5 | 161 | 130 | 124 |
| Idaho | 4029 | 886 | 48 | 4 | 20 | 1342 | 0 | 0 | 10 | 8 | 8 |
| Illinois | 296529 | 65336 | 3507 | 297 | 1483 | 98744 | 36 | 25 | 771 | 623 | 593 |
| Indiana | 51005 | 11221 | 603 | 51 | 255 | 16985 | 6 | 4 | 133 | 107 | 102 |
| Iowa | 20905 | 4599 | 247 | 21 | 105 | 6961 | 3 | 2 | 54 | 44 | 42 |
| Kansas | 6232 | 1371 | 74 | 6 | 31 | 2075 | 1 | 1 | 16 | 13 | 12 |
| Kentucky | 16529 | 3636 | 196 | 17 | 83 | 5504 | 2 | 1 | 43 | 35 | 33 |
| Louisiana | 2642 | 581 | 31 | 3 | 13 | 880 | 0 | 0 | 7 | 6 | 5 |
| Maryland | 7375 | 1622 | 87 | 7 | 37 | 2456 | 1 | 1 | 19 | 15 | 15 |
| Missouri | 5947 | 1308 | 70 | 6 | 30 | 1980 | 1 | 1 | 15 | 12 | 12 |
| Montana | 182253 | 40096 | 2156 | 182 | 911 | 60690 | 22 | 15 | 474 | 383 | 365 |
| Nebraska | 33165 | 7296 | 392 | 33 | 166 | 11044 | 4 | 3 | 86 | 70 | 66 |
| New Mexico | 53198 | 11704 | 629 | 53 | 266 | 17715 | 6 | 5 | 138 | 112 | 106 |
| North Dakota | 30784 | 6772 | 364 | 31 | 154 | 10251 | 4 | 3 | 80 | 65 | 62 |
| Ohio | 154708 | 34036 | 1830 | 155 | 774 | 51518 | 19 | 13 | 402 | 325 | 309 |
| Oklahoma | 8344 | 1836 | 99 | 8 | 42 | 2778 | 1 | 1 | 22 | 18 | 17 |
| Pennsylvania | 88714 | 19517 | 1049 | 89 | 444 | 29542 | 11 | 8 | 231 | 186 | 177 |
| South Dakota | 10649 | 2343 | 126 | 11 | 53 | 3546 | 1 | 1 | 28 | 22 | 21 |
| Tennessee | 25617 | 5638 | 303 | 26 | 128 | 8534 | 3 | 2 | 67 | 54 | 51 |
| Texas | 287594 | 63271 | 3402 | 288 | 1435 | 95769 | 35 | 24 | 748 | 604 | 575 |
| Utah | 27086 | 5959 | 320 | 27 | 135 | 9020 | 3 | 2 | 70 | 57 | 54 |
| Virginia | 147043 | 32349 | 1739 | 147 | 735 | 48965 | 18 | 12 | 382 | 309 | 294 |
| West Virginia | 152066 | 33455 | 1797 | 152 | 760 | 50638 | 18 | 13 | 395 | 319 | 304 |
| Wyoming | 92182 | 20280 | 1090 | 92 | 461 | 30697 | 11 | 8 | 240 | 194 | 184 |

TABLE H-3. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE MID LEVEL 1985-1996

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 44895 | 9877 | 531 | 45 | 224 | 14950 | 5 | 4 | 117 | 94 | 90 |
| Arizona | 11342 | 2486 | 134 | 11 | 57 | 3763 | 1 | 1 | 29 | 24 | 23 |
| Arkansas | 67391 | 14826 | 797 | 67 | 337 | 22441 | 8 | 6 | 175 | 142 | 135 |
| Colorado | 34048 | 7490 | 403 | 34 | 170 | 11328 | 4 | 3 | 89 | 71 | 68 |
| Georgia | 38520 | 8474 | 456 | 39 | 193 | 12827 | 5 | 3 | 100 | 81 | 77 |
| Idaho | 17218 | 3788 | 204 | 17 | 86 | 5733 | 2 | 1 | 45 | 36 | 34 |
| Illinois | 113408 | 24950 | 1341 | 113 | 567 | 37765 | 14 | 10 | 295 | 238 | 227 |
| Indiana | 43865 | 9650 | 519 | 44 | 219 | 14607 | 5 | 4 | 114 | 92 | 88 |
| Iowa | 16585 | 3649 | 196 | 17 | 83 | 5523 | 2 | 1 | 43 | 35 | 33 |
| Kansas | -428 | -94 | -5 | 0 | -2 | -143 | 0 | 0 | -1 | -1 | -1 |
| Kentucky | 42621 | 9377 | 504 | 43 | 213 | 14193 | 5 | 4 | 111 | 90 | 85 |
| Louisiana | 1351 | 297 | 16 | 1 | 7 | 450 | 0 | 0 | 4 | 3 | 3 |
| Maryland | 5371 | 1186 | 64 | 5 | 27 | 1795 | 1 | 0 | 14 | 11 | 11 |
| Missouri | 12209 | 2686 | 144 | 12 | 61 | 4066 | 1 | 1 | 32 | 26 | 24 |
| Montana | 52530 | 11557 | 621 | 53 | 263 | 17492 | 6 | 4 | 137 | 110 | 105 |
| Nebraska | 28779 | 6331 | 340 | 29 | 144 | 9584 | 3 | 2 | 75 | 60 | 58 |
| New Mexico | 14178 | 3119 | 168 | 14 | 71 | 4721 | 2 | 1 | 37 | 30 | 28 |
| North Dakota | 19115 | 4205 | 226 | 19 | 96 | 6365 | 2 | 2 | 50 | 40 | 38 |
| Ohio | 36353 | 7998 | 430 | 36 | 182 | 12105 | 4 | 3 | 95 | 76 | 73 |
| Oklahoma | 1545 | 340 | 18 | 2 | 8 | 515 | 0 | 0 | 4 | 3 | 3 |
| Pennsylvania | 128168 | 28197 | 1516 | 128 | 641 | 42680 | 15 | 11 | 333 | 269 | 256 |
| South Dakota | 5926 | 1304 | 70 | 6 | 30 | 1973 | 1 | 1 | 15 | 12 | 12 |
| Tennessee | -7130 | -1569 | -84 | -7 | -36 | -2374 | -1 | -1 | -19 | -15 | -14 |
| Texas | 166760 | 36687 | 1972 | 167 | 834 | 55531 | 20 | 14 | 434 | 350 | 334 |
| Utah | 43477 | 9565 | 514 | 43 | 217 | 14478 | 5 | 4 | 113 | 91 | 87 |
| Virginia | 40163 | 8836 | 475 | 40 | 201 | 13374 | 5 | 3 | 104 | 84 | 80 |
| West Virginia | 32191 | 7082 | 381 | 32 | 161 | 10720 | 4 | 3 | 84 | 68 | 64 |
| Wyoming | 85889 | 18896 | 1016 | 86 | 429 | 28601 | 10 | 7 | 223 | 180 | 172 |

TABLE H-4. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE *PREFERRED ALTERNATIVE MID LEVEL 1990-1995*

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 4355 | 958 | 52 | 4 | 22 | 1450 | 1 | 0 | 11 | 9 | 9 |
| Arizona | 22455 | 4940 | 266 | 22 | 112 | 7478 | 3 | 2 | 58 | 47 | 45 |
| Arkansas | 113199 | 24904 | 1339 | 113 | 561 | 37695 | 14 | 10 | 294 | 238 | 226 |
| Colorado | 66815 | 14699 | 790 | 67 | 334 | 22249 | 8 | 6 | 174 | 140 | 134 |
| Georgia | 43547 | 5110 | 279 | 24 | 118 | 7841 | 3 | 2 | 61 | 49 | 47 |
| Idaho | -8035 | -1768 | -95 | -8 | -40 | -2677 | -1 | -1 | -21 | -17 | -16 |
| Illinois | 172198 | 42284 | 2273 | 172 | 961 | 64002 | 23 | 16 | 500 | 404 | 384 |
| Indiana | 13265 | 2911 | 157 | 13 | 66 | 4417 | 2 | 1 | 34 | 28 | 27 |
| Iowa | 6139 | 1505 | 81 | 7 | 34 | 2277 | 1 | 1 | 18 | 14 | 14 |
| Kansas | 8945 | 1968 | 106 | 9 | 45 | 2979 | 1 | 1 | 23 | 19 | 18 |
| Kentucky | 59874 | 13172 | 708 | 60 | 299 | 19918 | 7 | 5 | 154 | 126 | 120 |
| Louisiana | 1882 | 414 | 22 | 2 | 9 | 627 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 28290 | 6224 | 335 | 28 | 141 | 9430 | 3 | 2 | 74 | 59 | 57 |
| Missouri | 9340 | 955 | 51 | 4 | 22 | 1445 | 1 | 0 | 11 | 9 | 9 |
| Montana | 104841 | 23065 | 1240 | 105 | 524 | 34912 | 13 | 9 | 273 | 220 | 210 |
| Nebraska | 15213 | 3347 | 180 | 15 | 76 | 5066 | 2 | 1 | 40 | 32 | 30 |
| New Mexico | 32767 | 7209 | 388 | 33 | 164 | 10912 | 4 | 3 | 85 | 69 | 66 |
| North Dakota | 35317 | 7770 | 419 | 35 | 177 | 11761 | 4 | 3 | 92 | 74 | 71 |
| Ohio | 21170 | 4657 | 250 | 21 | 106 | 7050 | 3 | 2 | 55 | 44 | 42 |
| Oklahoma | 6227 | 1370 | 74 | 6 | 31 | 2074 | 1 | 1 | 16 | 13 | 12 |
| Pennsylvania | -1177 | -413 | -22 | -2 | -9 | -675 | 0 | 0 | -5 | -4 | -4 |
| South Dakota | 12842 | 2825 | 152 | 13 | 64 | 4276 | 2 | 1 | 33 | 27 | 26 |
| Tennessee | 61394 | 13507 | 726 | 61 | 307 | 20444 | 7 | 5 | 160 | 129 | 123 |
| Texas | 217806 | 47917 | 2576 | 218 | 1089 | 72539 | 26 | 19 | 566 | 457 | 436 |
| Utah | 13586 | 2989 | 161 | 14 | 68 | 4524 | 2 | 1 | 35 | 29 | 27 |
| Virginia | 24434 | 5375 | 289 | 24 | 122 | 8137 | 3 | 2 | 64 | 51 | 49 |
| West Virginia | 55896 | 12293 | 661 | 56 | 279 | 18607 | 7 | 5 | 145 | 117 | 112 |
| Wyom | 9549 | 2091 | 1124 | 95 | 475 | 31651 | 11 | 8 | 247 | 200 | 190 |

TABLE N-6. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE LOW LEVEL 1975-1976

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 9083 | 1998 | 107 | 9 | 45 | 3025 | 1 | 1 | 24 | 19 | 18 |
| Arizona | 16453 | 3620 | 195 | 16 | 82 | 5479 | 2 | 1 | 43 | 35 | 33 |
| Arkansas | 34955 | 7690 | 413 | 35 | 175 | 11640 | 4 | 3 | 91 | 73 | 70 |
| Colorado | 21925 | 4823 | 259 | 22 | 110 | 7301 | 3 | 2 | 57 | 46 | 44 |
| Georgia | 23868 | 5251 | 282 | 24 | 119 | 7948 | 3 | 2 | 62 | 50 | 48 |
| Idaho | 8175 | 1799 | 97 | 8 | 41 | 2722 | 1 | 1 | 21 | 17 | 16 |
| Illinois | 130233 | 28651 | 1540 | 130 | 651 | 43368 | 16 | 11 | 337 | 273 | 260 |
| Indiana | 35119 | 7726 | 415 | 35 | 176 | 11694 | 4 | 3 | 91 | 74 | 70 |
| Iowa | 11494 | 2528 | 136 | 11 | 57 | 3826 | 1 | 1 | 30 | 24 | 23 |
| Kansas | 3983 | 876 | 47 | 4 | 20 | 1326 | 0 | 0 | 10 | 8 | 8 |
| Kentucky | 18914 | 4161 | 224 | 19 | 95 | 6299 | 2 | 2 | 47 | 40 | 38 |
| Louisiana | 862 | 190 | 10 | 1 | 4 | 287 | 0 | 0 | 2 | 2 | 2 |
| Maryland | 6181 | 1360 | 73 | 6 | 31 | 2058 | 1 | 1 | 16 | 13 | 13 |
| Missouri | 7823 | 1721 | 93 | 8 | 39 | 2605 | 1 | 1 | 20 | 16 | 16 |
| Montana | 33507 | 7372 | 396 | 34 | 168 | 11158 | 4 | 3 | 87 | 70 | 67 |
| Nebraska | 23572 | 5186 | 279 | 24 | 118 | 7850 | 3 | 2 | 61 | 50 | 47 |
| New Mexico | 4289 | 944 | 51 | 4 | 21 | 1428 | 1 | 0 | 11 | 9 | 9 |
| North Dakota | 17141 | 3771 | 203 | 17 | 86 | 5708 | 2 | 1 | 45 | 36 | 34 |
| Ohio | 39193 | 8623 | 464 | 39 | 196 | 13051 | 5 | 3 | 102 | 82 | 78 |
| Oklahoma | -1209 | -266 | -14 | -1 | -6 | -402 | 0 | 0 | -3 | -3 | -2 |
| Pennsylvania | 114780 | 25252 | 1358 | 115 | 574 | 38222 | 14 | 10 | 298 | 241 | 230 |
| South Dakota | 4784 | 1052 | 57 | 5 | 24 | 1593 | 1 | 0 | 12 | 10 | 10 |
| Tennessee | -5233 | -1151 | -62 | -5 | -26 | -1742 | -1 | 0 | -14 | -11 | -10 |
| Texas | 114826 | 25262 | 1358 | 115 | 574 | 38237 | 14 | 10 | 299 | 241 | 230 |
| Utah | 23001 | 5060 | 272 | 23 | 115 | 7659 | 3 | 2 | 60 | 48 | 46 |
| Virginia | 36424 | 8013 | 431 | 36 | 182 | 12129 | 4 | 3 | 95 | 76 | 73 |
| West Virginia | 30350 | 6677 | 359 | 30 | 152 | 10107 | 4 | 3 | 79 | 64 | 61 |
| Wyoming | 59695 | 13133 | 706 | 60 | 298 | 19879 | 7 | 5 | 155 | 125 | 119 |

TABLE H-4. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE LOW LEVEL 1990 - 1995

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 11089 | 2439 | 131 | 11 | 55 | 3692 | 1 | 1 | 29 | 23 | 22 |
| Arizona | 2774 | 610 | 33 | 3 | 14 | 924 | 0 | 0 | 7 | 6 | 6 |
| Arkansas | 3264 | 718 | 39 | 3 | 16 | 1087 | 0 | 0 | 8 | 7 | 7 |
| Colorado | 45268 | 9959 | 535 | 45 | 226 | 15074 | 5 | 4 | 118 | 95 | 91 |
| Georgia | -7206 | -1585 | -85 | -7 | -36 | -2400 | -1 | -1 | -19 | -15 | -14 |
| Idaho | 2545 | 560 | 30 | 3 | 13 | 847 | 0 | 0 | 7 | 5 | 5 |
| Illinois | 124481 | 27386 | 1472 | 124 | 622 | 41452 | 15 | 11 | 324 | 261 | 249 |
| Indiana | 21877 | 4813 | 259 | 22 | 109 | 7286 | 3 | 2 | 57 | 46 | 44 |
| Iowa | 5064 | 1114 | 60 | 5 | 25 | 1686 | 1 | 0 | 13 | 11 | 10 |
| Kansas | -1137 | -250 | -13 | -1 | -6 | -379 | 0 | 0 | -3 | -2 | -2 |
| Kentucky | 8884 | 1955 | 105 | 9 | 44 | 2958 | 1 | 1 | 23 | 19 | 18 |
| Louisiana | 194 | 43 | 2 | 0 | 1 | 65 | 0 | 0 | 1 | 0 | 0 |
| Maryland | 12199 | 2684 | 144 | 12 | 61 | 4062 | 1 | 1 | 32 | 26 | 24 |
| Missouri | 6110 | 1344 | 72 | 6 | 31 | 2035 | 1 | 1 | 16 | 13 | 12 |
| Montana | 18763 | 4128 | 222 | 19 | 94 | 6248 | 2 | 2 | 49 | 39 | 38 |
| Nebraska | 6156 | 1354 | 73 | 6 | 31 | 2050 | 1 | 1 | 16 | 13 | 12 |
| New Mexico | 13658 | 3005 | 162 | 14 | 68 | 4548 | 2 | 1 | 36 | 29 | 27 |
| North Dakota | 7783 | 1712 | 92 | 8 | 39 | 2592 | 1 | 1 | 20 | 16 | 16 |
| Ohio | -11659 | -2565 | -138 | -12 | -58 | -3882 | -1 | -1 | -30 | -24 | -23 |
| Oklahoma | 663 | 144 | 8 | 1 | 3 | 217 | 0 | 0 | 2 | 1 | 1 |
| Pennsylvania | -7211 | -1587 | -85 | -7 | -36 | -2401 | -1 | -1 | -19 | -15 | -14 |
| South Dakota | 1836 | 404 | 22 | 2 | 9 | 611 | 0 | 0 | 5 | 4 | 4 |
| Tennessee | 17212 | 3787 | 204 | 17 | 86 | 5732 | 2 | 1 | 45 | 36 | 34 |
| Texas | 55462 | 12202 | 656 | 55 | 277 | 18469 | 7 | 5 | 144 | 116 | 111 |
| Utah | 15555 | 3422 | 184 | 16 | 78 | 5180 | 2 | 1 | 40 | 33 | 31 |
| Virginia | 19553 | 4302 | 231 | 20 | 98 | 6511 | 2 | 2 | 51 | 41 | 39 |
| West Virginia | -12480 | -2746 | -148 | -12 | -62 | -4156 | -1 | -1 | -32 | -26 | -25 |
| Wyoming | 29325 | 6451 | 347 | 29 | 147 | 9765 | 4 | 2 | 76 | 62 | 59 |

TABLE N-7. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE HIGH LEVEL 1985-1996

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 77,704 | 17,095 | 919 | 78 | 389 | 25,875 | 9 | 7 | 202 | 163 | 155 |
| Arizona | 23,496 | 5,169 | 278 | 23 | 117 | 7,824 | 3 | 2 | 61 | 49 | 47 |
| Arkansas | 56,258 | 12,377 | 665 | 56 | 281 | 18,734 | 7 | 5 | 146 | 118 | 113 |
| Colorado | 44,436 | 9,776 | 526 | 44 | 222 | 14,797 | 5 | 4 | 116 | 93 | 89 |
| Georgia | 35,873 | 7,892 | 424 | 36 | 179 | 11,946 | 4 | 3 | 93 | 75 | 72 |
| Idaho | 8,644 | 1,902 | 102 | 9 | 43 | 2,879 | 1 | 1 | 22 | 18 | 17 |
| Illinois | 98,261 | 21,618 | 1,162 | 98 | 491 | 32,721 | 12 | 8 | 255 | 206 | 197 |
| Indiana | 28,448 | 6,259 | 336 | 28 | 142 | 9,473 | 3 | 2 | 74 | 60 | 57 |
| Iowa | 14,948 | 3,289 | 177 | 15 | 75 | 4,978 | 2 | 1 | 39 | 31 | 30 |
| Kansas | 4,075 | 896 | 48 | 4 | 20 | 1,357 | 0 | 0 | 11 | 9 | 8 |
| Kentucky | 28,438 | 6,256 | 336 | 28 | 142 | 9,470 | 3 | 2 | 74 | 60 | 57 |
| Louisiana | 1,841 | 405 | 22 | 2 | 9 | 613 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 27,183 | 5,980 | 322 | 27 | 136 | 9,052 | 3 | 2 | 71 | 57 | 54 |
| Missouri | 11,755 | 2,586 | 139 | 12 | 59 | 3,915 | 1 | 1 | 31 | 25 | 24 |
| Montana | 57,910 | 12,740 | 685 | 58 | 290 | 19,284 | 7 | 5 | 151 | 122 | 116 |
| Nebraska | 32,099 | 7,062 | 380 | 32 | 160 | 10,689 | 4 | 3 | 83 | 67 | 64 |
| New Mexico | 32,992 | 7,258 | 390 | 33 | 165 | 10,986 | 4 | 3 | 86 | 69 | 66 |
| North Dakota | 40,474 | 8,904 | 479 | 40 | 202 | 13,478 | 5 | 3 | 105 | 85 | 81 |
| Ohio | 42,845 | 9,426 | 507 | 43 | 214 | 14,267 | 5 | 4 | 111 | 90 | 86 |
| Oklahoma | 6,115 | 1,345 | 72 | 6 | 31 | 2,036 | 1 | 1 | 16 | 13 | 12 |
| Pennsylvania | 133,435 | 27,153 | 1,460 | 123 | 617 | 41,100 | 15 | 10 | 321 | 259 | 247 |
| South Dakota | 10,231 | 2,251 | 121 | 10 | 51 | 3,407 | 1 | 1 | 27 | 21 | 20 |
| Tennessee | -3,922 | -863 | -46 | -4 | -20 | -1,306 | 0 | 0 | 10 | 8 | 8 |
| Texas | 153,382 | 33,744 | 1,814 | 153 | 767 | 51,076 | 18 | 13 | 399 | 322 | 307 |
| Utah | 62,730 | 13,801 | 748 | 63 | 314 | 20,889 | 8 | 5 | 163 | 132 | 125 |
| Virginia | 28,453 | 6,260 | 337 | 28 | 142 | 9,475 | 3 | 2 | 74 | 60 | 57 |
| West Virginia | 2,703 | 595 | 32 | 3 | 14 | 900 | 0 | 0 | 7 | 6 | 5 |
| Wyoming | 141,963 | 31,232 | 1,677 | 142 | 710 | 47,314 | 17 | 12 | 369 | 298 | 284 |

TABLE H-8. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE No Leasing Alternative High Level 1990-1995

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 7,135 | 1,570 | 84 | 7 | 36 | 2,376 | 1 | 1 | 19 | 15 | 14 |
| Arizona | -3,131 | -689 | -37 | -3 | -16 | -1,043 | 0 | 0 | -8 | -7 | -6 |
| Arkansas | 134,813 | 29,659 | 1,595 | 135 | 674 | 44,893 | 16 | 11 | 351 | 283 | 270 |
| Colorado | 52,657 | 11,585 | 623 | 53 | 263 | 17,535 | 6 | 4 | 137 | 111 | 105 |
| Georgia | 28,070 | 6,175 | 332 | 28 | 140 | 9,347 | 3 | 2 | 73 | 59 | 56 |
| Idaho | 3,748 | 825 | 44 | 4 | 19 | 1,248 | 0 | 0 | 10 | 8 | 7 |
| Illinois | 174,241 | 38,333 | 2,061 | 174 | 871 | 58,022 | 21 | 15 | 453 | 366 | 348 |
| Indiana | 21,231 | 4,671 | 251 | 21 | 106 | 7,070 | 3 | 2 | 55 | 45 | 42 |
| Iowa | 8,522 | 1,875 | 101 | 9 | 43 | 2,838 | 1 | 1 | 22 | 18 | 17 |
| Kansas | 510 | 112 | 6 | 1 | 3 | 170 | 0 | 0 | 1 | 1 | 1 |
| Kentucky | 51,806 | 11,397 | 613 | 52 | 259 | 17,251 | 6 | 4 | 135 | 109 | 104 |
| Louisiana | 1,137 | 250 | 13 | 1 | 6 | 379 | 0 | 0 | 3 | 2 | 2 |
| Maryland | 867 | 191 | 10 | 1 | 4 | 289 | 0 | 0 | 2 | 2 | 2 |
| Missouri | 2,530 | 557 | 30 | 3 | 13 | 842 | 0 | 0 | 7 | 5 | 5 |
| Montana | 38,332 | 8,433 | 453 | 38 | 192 | 12,764 | 5 | 3 | 100 | 80 | 77 |
| Nebraska | 9,823 | 2,161 | 116 | 10 | 49 | 3,271 | 1 | 1 | 26 | 21 | 20 |
| New Mexico | 34,639 | 7,621 | 410 | 35 | 173 | 11,535 | 4 | 3 | 90 | 73 | 69 |
| North Dakota | 33,170 | 7,297 | 392 | 33 | 166 | 11,046 | 4 | 3 | 86 | 70 | 66 |
| Ohio | 16,488 | 3,627 | 195 | 16 | 82 | 5,491 | 2 | 1 | 43 | 35 | 33 |
| Oklahoma | 8,619 | 1,896 | 102 | 9 | 43 | 2,870 | 1 | 1 | 22 | 18 | 17 |
| Pennsylvania | -3,575 | -787 | -42 | -4 | -18 | -1,191 | 0 | 0 | -9 | -8 | -7 |
| South Dakota | 15,346 | 3,376 | 182 | 15 | 77 | 5,110 | 2 | 1 | 40 | 32 | 31 |
| Tennessee | 56,737 | 12,482 | 671 | 57 | 284 | 18,894 | 7 | 5 | 148 | 119 | 113 |
| Texas | 230,443 | 50,698 | 2,726 | 230 | 1,152 | 76,738 | 28 | 20 | 599 | 484 | 461 |
| Utah | 23,077 | 5,077 | 273 | 23 | 115 | 7,685 | 3 | 2 | 60 | 48 | 46 |
| Virginia | 45,640 | 10,041 | 540 | 46 | 228 | 15,198 | 5 | 4 | 119 | 96 | 91 |
| West Virginia | 89,602 | 19,712 | 1,060 | 90 | 448 | 29,837 | 11 | 8 | 233 | 188 | 179 |
| Wyoming | 40,066 | 8,814 | 474 | 40 | 200 | 13,342 | 5 | 3 | 104 | 84 | 80 |

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TABLE II-9. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE N. LEASING ALTERNATIVE MID LEVEL 1975-1976

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 47,323 | 10,411 | 560 | 47 | 237 | 15,759 | 6 | 4 | 123 | 99 | 95 |
| Arizona | 12,046 | 2,650 | 142 | 12 | 60 | 4,011 | 1 | 1 | 31 | 25 | 24 |
| Arkansas | 65,305 | 14,367 | 772 | 65 | 327 | 21,747 | 8 | 6 | 170 | 137 | 131 |
| Colorado | 32,135 | 7,070 | 380 | 32 | 161 | 10,701 | 4 | 3 | 84 | 67 | 64 |
| Georgia | 38,515 | 8,473 | 456 | 39 | 193 | 12,826 | 5 | 3 | 100 | 81 | 77 |
| Idaho | 16,611 | 3,654 | 196 | 17 | 83 | 5,531 | 2 | 1 | 43 | 35 | 33 |
| Illinois | 112,212 | 24,704 | 1,328 | 112 | 561 | 37,393 | 13 | 10 | 292 | 236 | 225 |
| Indiana | 43,197 | 9,503 | 511 | 43 | 216 | 14,365 | 5 | 4 | 112 | 91 | 86 |
| Iowa | 16,447 | 3,618 | 195 | 16 | 82 | 5,477 | 2 | 1 | 43 | 35 | 33 |
| Kansas | -454 | -100 | -5 | 0 | -2 | -151 | 0 | 0 | -1 | -1 | -1 |
| Kentucky | 42,131 | 9,269 | 498 | 42 | 211 | 14,030 | 5 | 4 | 110 | 88 | 84 |
| Louisiana | 1,351 | 297 | 16 | 1 | 7 | 450 | 0 | 0 | 4 | 3 | 3 |
| Maryland | 5,375 | 1,183 | 64 | 5 | 27 | 1,790 | 1 | 0 | 14 | 11 | 11 |
| Missouri | 12,291 | 2,704 | 145 | 12 | 61 | 4,093 | 1 | 1 | 32 | 26 | 25 |
| Montana | 39,678 | 8,729 | 469 | 40 | 198 | 13,213 | 5 | 3 | 103 | 83 | 79 |
| Nebraska | 28,453 | 6,260 | 337 | 28 | 142 | 9,475 | 3 | 2 | 74 | 60 | 57 |
| New Mexico | 14,158 | 3,115 | 167 | 14 | 71 | 4,714 | 2 | 1 | 37 | 30 | 28 |
| North Dakota | 19,074 | 4,196 | 226 | 19 | 95 | 6,352 | 2 | 2 | 50 | 40 | 38 |
| Ohio | 36,439 | 8,017 | 431 | 36 | 182 | 12,134 | 4 | 3 | 95 | 77 | 73 |
| Oklahoma | 1,734 | 381 | 21 | 2 | 9 | 577 | 0 | 0 | 5 | 4 | 3 |
| Pennsylvania | 128,219 | 28,208 | 1,517 | 128 | 641 | 42,697 | 15 | 11 | 333 | 269 | 256 |
| South Dakota | 5,921 | 1,303 | 70 | 6 | 30 | 1,972 | 1 | 1 | 15 | 12 | 12 |
| Tennessee | -7,063 | -1,554 | -84 | -7 | -35 | -2,352 | -1 | -1 | -18 | -15 | -14 |
| Texas | 164,296 | 36,145 | 1,943 | 164 | 821 | 54,711 | 20 | 14 | 427 | 345 | 329 |
| Utah | 42,983 | 9,456 | 508 | 43 | 215 | 14,313 | 5 | 4 | 112 | 90 | 86 |
| Virginia | 39,566 | 8,704 | 468 | 40 | 198 | 13,175 | 5 | 3 | 103 | 83 | 79 |
| West Virginia | 31,718 | 6,996 | 376 | 32 | 159 | 10,589 | 4 | 3 | 83 | 67 | 64 |
| Wyoming | 96,160 | 21,155 | 1,137 | 96 | 481 | 32,031 | 12 | 8 | 250 | 202 | 192 |

TABLE II-10. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE MID LEVEL 1990-1985

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 3,601 | 792 | 43 | 4 | 18 | 1,199 | 0 | 0 | 9 | 8 | 7 |
| Arizona | 21,124 | 4,647 | 250 | 21 | 106 | 7,034 | 3 | 2 | 55 | 44 | 42 |
| Arkansas | 111,083 | 24,438 | 1,314 | 111 | 555 | 36,991 | 13 | 9 | 289 | 233 | 222 |
| Colorado | 61,822 | 13,601 | 731 | 62 | 309 | 20,587 | 7 | 5 | 161 | 130 | 124 |
| Georgia | 23,506 | 5,171 | 278 | 24 | 118 | 7,827 | 3 | 2 | 61 | 49 | 47 |
| Idaho | -8,991 | -1,978 | -106 | -9 | -45 | -2,994 | -1 | -1 | -23 | -19 | -18 |
| Illinois | 202,414 | 44,531 | 2,394 | 202 | 1,012 | 67,404 | 24 | 17 | 526 | 425 | 405 |
| Indiana | 11,704 | 2,575 | 138 | 12 | 59 | 3898 | 1 | 1 | 30 | 25 | 23 |
| Iowa | 6,013 | 1,323 | 71 | 6 | 30 | 2,002 | 1 | 1 | 16 | 13 | 12 |
| Kansas | 8,726 | 1,920 | 103 | 9 | 44 | 2,906 | 1 | 1 | 23 | 18 | 17 |
| Kentucky | 77,483 | 17,033 | 916 | 77 | 387 | 25,782 | 9 | 7 | 201 | 163 | 155 |
| Louisiana | 1,882 | 414 | 22 | 2 | 9 | 627 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 28,223 | 6,209 | 334 | 28 | 141 | 9.398 | 3 | 2 | 73 | 59 | 56 |
| Missouri | 9,522 | 2,095 | 113 | 10 | 48 | 3,171 | 1 | 1 | 25 | 20 | 19 |
| Montana | 47,496 | 10,449 | 562 | 47 | 237 | 15,816 | 6 | 4 | 123 | 100 | 95 |
| Nebraska | 13,760 | 3,027 | 163 | 14 | 69 | 4,582 | 2 | 1 | 36 | 29 | 28 |
| New Mexico | 42,162 | 9,276 | 499 | 42 | 211 | 14,040 | 5 | 4 | 110 | 89 | 84 |
| North Dakota | 39,168 | 8,617 | 463 | 39 | 196 | 13,043 | 5 | 3 | 102 | 82 | 78 |
| Ohio | 20,731 | 4,561 | 245 | 21 | 104 | 6,904 | 2 | 2 | 54 | 44 | 41 |
| Oklahoma | 7,767 | 1,709 | 92 | 8 | 39 | 2,587 | 1 | 1 | 20 | 16 | 16 |
| Pennsylvania | -3,417 | -752 | -40 | -3 | -17 | -1,138 | 0 | 0 | 9 | 7 | 7 |
| South Dakota | 16,147 | 3,552 | 191 | 16 | 81 | 5,377 | 2 | 1 | 42 | 34 | 32 |
| Tennessee | 61,256 | 13,476 | 725 | 61 | 306 | 20,398 | 7 | 5 | 159 | 129 | 123 |
| Texas | 238,823 | 52,541 | 2,825 | 239 | 1,194 | 79,528 | 29 | 20 | 631 | 502 | 478 |
| Utah | 21,308 | 4,688 | 252 | 21 | 107 | 7,095 | 3 | 2 | 65 | 53 | 50 |
| Virginia | 25,179 | 5,539 | 298 | 25 | 126 | 8,384 | 3 | 2 | 65 | 53 | 50 |
| West Virginia | 55,865 | 12,290 | 661 | 56 | 279 | 18,603 | 7 | 5 | 145 | 117 | 112 |
| Wyom | 66,433 | 14,615 | 786 | 66 | 332 | 22,132 | 8 | 6 | 173 | 140 | 133 |

TABLE N-11. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE LOW LEVEL 1985-1976

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 6,798 | 1,496 | 80 | 7 | 34 | 2,264 | 1 | 1 | 18 | 14 | 14 |
| Arizona | 16,458 | 3,621 | 195 | 16 | 82 | 5,480 | 2 | 1 | 43 | 35 | 33 |
| Arkansas | 35,062 | 7,714 | 415 | 35 | 175 | 11,676 | 4 | 3 | 91 | 74 | 70 |
| Colorado | 21,955 | 4,830 | 260 | 22 | 110 | 7,311 | 3 | 2 | 57 | 46 | 44 |
| Georgia | 23,873 | 5,252 | 282 | 24 | 119 | 7,950 | 3 | 2 | 62 | 50 | 48 |
| Idaho | 8,180 | 1,800 | 97 | 8 | 41 | 2,724 | 1 | 1 | 21 | 17 | 16 |
| Illinois | 130,259 | 28,657 | 1,541 | 130 | 651 | 43,376 | 16 | 11 | 339 | 274 | 261 |
| Indiana | 35,144 | 7,732 | 416 | 35 | 176 | 11,703 | 4 | 3 | 91 | 74 | 70 |
| Iowa | 11,500 | 2,530 | 136 | 12 | 58 | 3,830 | 1 | 1 | 30 | 24 | 23 |
| Kansas | 3,993 | 879 | 47 | 4 | 20 | 1,330 | 0 | 0 | 10 | 8 | 8 |
| Kentucky | 18,977 | 4,175 | 224 | 19 | 95 | 6,319 | 2 | 2 | 49 | 40 | 38 |
| Louisiana | 862 | 190 | 10 | 1 | 4 | 287 | 0 | 0 | 2 | 2 | 2 |
| Maryland | 6,191 | 1,362 | 73 | 6 | 31 | 2,062 | 1 | 1 | 16 | 13 | 12 |
| Missouri | 7,742 | 1,703 | 92 | 8 | 39 | 2,578 | 1 | 1 | 20 | 16 | 15 |
| Montana | 33,532 | 7,377 | 397 | 34 | 168 | 11,166 | 4 | 3 | 87 | 70 | 67 |
| Nebraska | 23,623 | 5,197 | 279 | 24 | 118 | 7,867 | 3 | 2 | 61 | 50 | 47 |
| New Mexico | 4,294 | 946 | 51 | 4 | 21 | 1,432 | 1 | 0 | 11 | 9 | 9 |
| North Dakota | 17,161 | 3,776 | 203 | 17 | 86 | 5,715 | 2 | 1 | 45 | 36 | 34 |
| Ohio | 39,061 | 8,593 | 462 | 39 | 195 | 13,007 | 5 | 3 | 102 | 82 | 78 |
| Oklahoma | -1,107 | -243 | -13 | -1 | -6 | -369 | 0 | 0 | -3 | -2 | -2 |
| Pennsylvania | 114,857 | 25,268 | 1,359 | 115 | 574 | 38,247 | 14 | 10 | 299 | 241 | 230 |
| South Dakota | 4,789 | 1,054 | 57 | 5 | 24 | 1,595 | 1 | 0 | 12 | 10 | 10 |
| Tennessee | -5,222 | -1,149 | -62 | -5 | -26 | -1,739 | -1 | 0 | -14 | -11 | -10 |
| Texas | 114,837 | 25,261 | 1,358 | 115 | 574 | 38,241 | 14 | 10 | 299 | 241 | 230 |
| Utah | 23,006 | 5,061 | 272 | 23 | 115 | 7,661 | 3 | 2 | 60 | 48 | 46 |
| Virginia | 36,440 | 8,017 | 431 | 36 | 182 | 12,134 | 4 | 3 | 95 | 77 | 73 |
| West Virginia | 30,381 | 6,684 | 359 | 30 | 152 | 10,127 | 4 | 3 | 79 | 64 | 61 |
| Wyoming | 59,721 | 13,139 | 706 | 60 | 299 | 19,887 | 7 | 5 | 155 | 125 | 119 |

TABLE H-12. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE *No Leasing Alternative Low Level 1990-1985*

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 14,443 | 3,178 | 171 | 14 | 72 | 4,810 | 2 | 1 | 38 | 30 | 29 |
| Arizona | 2,754 | 606 | 33 | 3 | 14 | 917 | 0 | 0 | 7 | 6 | 6 |
| Arkansas | 3,080 | 678 | 36 | 3 | 15 | 1,026 | 0 | 0 | 8 | 6 | 6 |
| Colorado | 41,621 | 9,157 | 492 | 42 | 208 | 13,860 | 5 | 4 | 108 | 87 | 83 |
| Georgia | -7,211 | -1,587 | -85 | -7 | -36 | -2,401 | -1 | -1 | -19 | -15 | -14 |
| Idaho | 2,361 | 519 | 28 | 2 | 12 | 786 | 0 | 0 | 6 | 5 | 5 |
| Illinois | 125,608 | 27,634 | 1,486 | 126 | 628 | 41,827 | 15 | 11 | 327 | 264 | 251 |
| Indiana | 22,159 | 4,875 | 262 | 22 | 111 | 7,379 | 3 | 2 | 58 | 47 | 44 |
| Iowa | 4,865 | 1,070 | 58 | 5 | 24 | 1,620 | 1 | 0 | 13 | 10 | 10 |
| Kansas | -1,153 | -254 | -14 | -1 | -6 | -384 | 0 | 0 | -3 | -2 | -2 |
| Kentucky | 8,792 | 1,934 | 104 | 9 | 44 | 2,928 | 1 | 1 | 23 | 18 | 18 |
| Louisiana | 189 | 42 | 2 | 0 | 1 | 63 | 0 | 0 | 0 | 0 | 0 |
| Maryland | 12,189 | 2,682 | 144 | 12 | 61 | 4,059 | 1 | 1 | 32 | 26 | 24 |
| Missouri | 6,232 | 1,371 | 74 | 6 | 31 | 2,075 | 1 | 1 | 16 | 13 | 12 |
| Montana | 16,004 | 3,521 | 189 | 16 | 80 | 5,329 | 2 | 1 | 42 | 34 | 32 |
| Nebraska | 6,089 | 1,340 | 72 | 6 | 30 | 2,028 | 1 | 1 | 16 | 13 | 12 |
| New Mexico | 13,642 | 3,001 | 161 | 14 | 68 | 4,543 | 2 | 1 | 35 | 29 | 27 |
| North Dakota | 7,589 | 1,670 | 90 | 8 | 38 | 2,527 | 1 | 1 | 20 | 16 | 15 |
| Ohio | -11,531 | -2,535 | -136 | -12 | -58 | -3,836 | -1 | -1 | -30 | -24 | -23 |
| Oklahoma | 632 | 139 | 7 | 1 | 3 | 211 | 0 | 0 | 2 | 1 | 1 |
| Pennsylvania | -7,308 | -1,608 | -86 | -7 | -37 | -2,434 | -1 | -1 | -19 | -15 | -15 |
| South Dakota | 1,831 | 403 | 22 | 2 | 9 | 610 | 0 | 0 | 5 | 4 | 4 |
| Tennessee | 17,192 | 3,782 | 203 | 17 | 86 | 5,725 | 2 | 1 | 45 | 36 | 34 |
| Texas | 56,717 | 12,478 | 671 | 57 | 284 | 18,881 | 7 | 5 | 147 | 119 | 113 |
| Utah | 15,356 | 3,378 | 182 | 15 | 77 | 5,114 | 2 | 1 | 40 | 32 | 31 |
| Virginia | 17,538 | 4,298 | 231 | 20 | 98 | 6,506 | 2 | 2 | 51 | 41 | 39 |
| West Virginia | -12,520 | -2,755 | -148 | -13 | -63 | -4,169 | -2 | -1 | -33 | -26 | -25 |
| Wyo | 30,115 | 6,625 | 356 | 30 | 151 | 10,028 | 4 | 3 | 78 | 63 | 60 |

TABLE N-13. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERENCE RIGHT LEASING ALTERNATIVE MIDLEVEL 1975-1976

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 45497 | 10009 | 538 | 45 | 207 | 15151 | 5 | 4 | 118 | 96 | 91 |
| Arizona | 11827 | 2602 | 140 | 12 | 59 | 3938 | 1 | 1 | 31 | 25 | 24 |
| Arkansas | 65152 | 14334 | 771 | 65 | 326 | 21696 | 8 | 6 | 169 | 137 | 130 |
| Colorado | 33742 | 7423 | 399 | 34 | 169 | 11236 | 4 | 3 | 88 | 71 | 67 |
| Georgia | 38607 | 8494 | 457 | 39 | 193 | 12856 | 5 | 3 | 100 | 81 | 77 |
| Idaho | 16651 | 3663 | 197 | 17 | 83 | 5545 | 2 | 1 | 43 | 35 | 33 |
| Illinois | 112021 | 24645 | 1325 | 112 | 560 | 37303 | 13 | 10 | 291 | 235 | 224 |
| Indiana | 43238 | 9512 | 511 | 43 | 216 | 14398 | 5 | 4 | 112 | 91 | 86 |
| Iowa | 16453 | 3620 | 195 | 16 | 82 | 5479 | 2 | 1 | 43 | 35 | 33 |
| Kansas | -423 | -93 | -5 | 0 | -2 | -141 | 0 | 0 | -1 | -1 | -1 |
| Kentucky | 41947 | 9228 | 496 | 42 | 210 | 13969 | 5 | 4 | 109 | 88 | 84 |
| Louisiana | 1290 | 284 | 15 | 1 | 6 | 430 | 0 | 0 | 3 | 3 | 3 |
| Maryland | 5375 | 1183 | 64 | 5 | 27 | 1790 | 1 | 0 | 14 | 11 | 11 |
| Missouri | 12209 | 2686 | 144 | 12 | 61 | 4066 | 1 | 1 | 32 | 26 | 24 |
| Montana | 39811 | 8758 | 471 | 40 | 199 | 13257 | 5 | 3 | 104 | 84 | 80 |
| Nebraska | 28499 | 6270 | 337 | 28 | 142 | 9490 | 3 | 2 | 74 | 60 | 57 |
| New Mexico | 14122 | 3107 | 167 | 14 | 71 | 4703 | 2 | 1 | 37 | 30 | 28 |
| North Dakota | 19074 | 4196 | 226 | 19 | 95 | 6352 | 2 | 2 | 50 | 40 | 38 |
| Ohio | 36470 | 8023 | 431 | 36 | 182 | 12145 | 4 | 3 | 95 | 77 | 73 |
| Oklahoma | 1494 | 329 | 18 | 1 | 7 | 498 | 0 | 0 | 4 | 3 | 3 |
| Pennsylvania | 138219 | 28208 | 1517 | 128 | 641 | 42697 | 15 | 11 | 333 | 269 | 256 |
| South Dakota | 5742 | 1308 | 70 | 6 | 30 | 1980 | 1 | 1 | 15 | 12 | 12 |
| Tennessee | -7211 | -1587 | -85 | -7 | -36 | -2401 | -1 | -1 | -19 | -15 | -14 |
| Texas | 164026 | 36086 | 1940 | 164 | 830 | 54631 | 20 | 14 | 426 | 344 | 328 |
| Utah | 43850 | 9437 | 507 | 43 | 214 | 14269 | 5 | 4 | 111 | 90 | 86 |
| Virginia | 39841 | 8765 | 471 | 40 | 199 | 13267 | 5 | 3 | 104 | 84 | 80 |
| West Virginia | 31880 | 7014 | 377 | 32 | 159 | 10616 | 4 | 3 | 83 | 67 | 64 |
| Wyoming | 96579 | 21247 | 1142 | 97 | 483 | 32161 | 12 | 8 | 251 | 203 | 193 |

TABLE II-4. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE PREFFRENCE RIGHT LEASING ALTERNATIVE MID LEVEL 1990-1995

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 6814 | 1499 | 81 | 7 | 34 | 2269 | 1 | 1 | 18 | 14 | 14 |
| Arizona | 20594 | 4531 | 244 | 21 | 103 | 6858 | 2 | 2 | 54 | 43 | 41 |
| Arkansas | 110629 | 24338 | 1309 | 111 | 553 | 36839 | 13 | 9 | 288 | 232 | 221 |
| Colorado | 66851 | 14707 | 791 | 67 | 334 | 22261 | 8 | 6 | 174 | 140 | 134 |
| Georgia | 24194 | 5323 | 286 | 24 | 121 | 8057 | 3 | 2 | 63 | 51 | 48 |
| Idaho | -8624 | -1900 | -102 | -9 | -43 | -2875 | -1 | -1 | -22 | -18 | -17 |
| Illinois | 176648 | 38863 | 2089 | 177 | 883 | 58824 | 21 | 15 | 459 | 371 | 353 |
| Indiana | 12679 | 2789 | 150 | 13 | 63 | 4222 | 2 | 1 | 33 | 27 | 25 |
| Iowa | 6237 | 1372 | 74 | 6 | 31 | 2077 | 1 | 1 | 16 | 13 | 12 |
| Kansas | 8976 | 1975 | 106 | 9 | 45 | 2989 | 1 | 1 | 23 | 19 | 18 |
| Kentucky | 75913 | 16701 | 898 | 76 | 380 | 25279 | 9 | 6 | 197 | 159 | 152 |
| Louisiana | 1971 | 434 | 23 | 2 | 10 | 657 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 28254 | 6216 | 334 | 28 | 141 | 9409 | 3 | 2 | 73 | 59 | 57 |
| Missouri | 4070 | 895 | 48 | 4 | 20 | 1355 | 0 | 0 | 11 | 9 | 8 |
| Montana | 48011 | 10562 | 568 | 48 | 240 | 15988 | 6 | 4 | 125 | 101 | 96 |
| Nebraska | 14887 | 3275 | 176 | 15 | 74 | 4957 | 2 | 1 | 39 | 31 | 30 |
| New Mexico | 38352 | 8437 | 454 | 38 | 192 | 12771 | 5 | 3 | 100 | 81 | 77 |
| North Dakota | 37873 | 8332 | 448 | 38 | 189 | 12612 | 5 | 3 | 98 | 80 | 76 |
| Ohio | 20803 | 4577 | 246 | 21 | 104 | 6927 | 2 | 2 | 54 | 44 | 42 |
| Oklahoma | 7354 | 1618 | 87 | 7 | 37 | 2449 | 1 | 1 | 19 | 15 | 15 |
| Pennsylvania | -3636 | -800 | -43 | -4 | -18 | -1211 | 0 | 0 | -9 | -8 | -7 |
| South Dakota | 14897 | 3277 | 176 | 15 | 74 | 4961 | 2 | 1 | 39 | 31 | 30 |
| Tennessee | 64225 | 14141 | 760 | 64 | 321 | 21404 | 8 | 5 | 167 | 135 | 129 |
| Texas | 237098 | 52146 | 2804 | 237 | 1185 | 78930 | 28 | 20 | 616 | 478 | 474 |
| Utah | 13510 | 2972 | 160 | 14 | 68 | 4499 | 2 | 1 | 35 | 28 | 27 |
| Virginia | 24674 | 5428 | 292 | 25 | 123 | 8216 | 3 | 2 | 64 | 52 | 49 |
| West Virginia | 55656 | 12244 | 658 | 56 | 278 | 18534 | 7 | 5 | 145 | 117 | 111 |
| Wyoming | 102755 | 22606 | 1215 | 103 | 514 | 34217 | 12 | 9 | 267 | 216 | 206 |

TABLE II-15. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE SHORT TERM ALTERNATIVE MID LEVEL 1985-1976

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 47,165 | 10,376 | 558 | 47 | 236 | 15,706 | 6 | 4 | 123 | 99 | 94 |
| Arizona | 11,868 | 2,611 | 140 | 12 | 59 | 3,952 | 1 | 1 | 31 | 25 | 24 |
| Arkansas | 66,086 | 14,539 | 782 | 66 | 330 | 22,007 | 8 | 6 | 172 | 139 | 132 |
| Colorado | 32,604 | 7,173 | 386 | 33 | 163 | 10,857 | 4 | 3 | 85 | 68 | 65 |
| Georgia | 38,515 | 8,473 | 456 | 39 | 193 | 12,826 | 5 | 3 | 100 | 81 | 77 |
| Idaho | 16,830 | 3,703 | 199 | 17 | 84 | 5,604 | 2 | 1 | 44 | 35 | 34 |
| Illinois | 112,419 | 24,732 | 1,330 | 112 | 562 | 37,435 | 13 | 10 | 292 | 236 | 225 |
| Indiana | 43,437 | 9,556 | 514 | 43 | 217 | 14,464 | 5 | 4 | 113 | 91 | 87 |
| Iowa | 16,478 | 3,625 | 195 | 16 | 82 | 5,487 | 2 | 1 | 43 | 35 | 33 |
| Kansas | -444 | -98 | -5 | 0 | -2 | -148 | 0 | 0 | -1 | -1 | -1 |
| Kentucky | 41,993 | 9,239 | 497 | 42 | 210 | 13,984 | 5 | 4 | 109 | 88 | 84 |
| Louisiana | 1,300 | 286 | 15 | 1 | 7 | 433 | 0 | 0 | 3 | 3 | 3 |
| Maryland | 5,375 | 1,183 | 64 | 5 | 27 | 1,790 | 1 | 0 | 14 | 11 | 11 |
| Missouri | 13,265 | 2,698 | 145 | 12 | 61 | 4,084 | 1 | 1 | 32 | 26 | 25 |
| Montana | 43,436 | 9,666 | 520 | 44 | 220 | 14,631 | 5 | 4 | 114 | 92 | 88 |
| Nebraska | 28,575 | 6,287 | 338 | 29 | 143 | 9,516 | 3 | 2 | 74 | 60 | 57 |
| New Mexico | 14,112 | 3,105 | 167 | 14 | 71 | 4,699 | 2 | 1 | 37 | 30 | 28 |
| North Dakota | 14,084 | 4,179 | 226 | 19 | 95 | 6,355 | 2 | 2 | 50 | 40 | 38 |
| Ohio | 36,419 | 8,012 | 431 | 36 | 182 | 12,138 | 4 | 3 | 95 | 76 | 73 |
| Oklahoma | 1,744 | 384 | 21 | 2 | 9 | 581 | 0 | 0 | 5 | 4 | 3 |
| Pennsylvania | 127,113 | 28,202 | 1,516 | 128 | 641 | 42,688 | 15 | 11 | 333 | 269 | 256 |
| South Dakota | 5,447 | 1,208 | 70 | 6 | 30 | 1,180 | 1 | 1 | 15 | 12 | 12 |
| Tennessee | -7,222 | -1,589 | -85 | -7 | -36 | -2,405 | -1 | -1 | -19 | -15 | -14 |
| Texas | 164,573 | 36,209 | 1,970 | 165 | 824 | 54,903 | 20 | 14 | 429 | 346 | 330 |
| Utah | 43,059 | 9,473 | 504 | 43 | 215 | 14,339 | 5 | 4 | 112 | 90 | 86 |
| Virginia | 39,637 | 8,720 | 469 | 40 | 198 | 13,199 | 5 | 3 | 103 | 83 | 79 |
| West Virginia | 31,829 | 7,002 | 376 | 32 | 159 | 10,599 | 4 | 3 | 83 | 67 | 64 |
| Wyoming | 92,697 | 20,393 | 1,096 | 93 | 463 | 30,868 | 11 | 8 | 241 | 195 | 185 |

TABLE H-16. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE SHORT TERM ALTERNATIVE MID LEVEL 1970-1985

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 3825 | 841 | 45 | 4 | 19 | 1374 | 0 | 0 | 10 | 8 | 8 |
| Arizona | 21252 | 4675 | 251 | 21 | 106 | 7077 | 3 | 2 | 55 | 45 | 43 |
| Arkansas | 111058 | 24433 | 1314 | 111 | 555 | 36982 | 13 | 9 | 289 | 233 | 222 |
| Colorado | 63225 | 13909 | 748 | 63 | 316 | 21054 | 8 | 5 | 164 | 133 | 126 |
| Georgia | 23582 | 5188 | 279 | 24 | 118 | 7853 | 3 | 2 | 61 | 50 | 47 |
| Idaho | -9088 | -1999 | -107 | -9 | -45 | -3026 | -1 | -1 | -24 | -19 | -18 |
| Illinois | 199772 | 43954 | 2363 | 200 | 999 | 66531 | 24 | 17 | 519 | 420 | 400 |
| Indiana | 11592 | 2550 | 137 | 12 | 58 | 3860 | 1 | 1 | 30 | 24 | 23 |
| Iowa | 6018 | 1324 | 71 | 6 | 30 | 2004 | 1 | 1 | 16 | 13 | 12 |
| Kansas | 8701 | 1914 | 103 | 9 | 44 | 2897 | 1 | 1 | 23 | 18 | 17 |
| Kentucky | 73318 | 16130 | 867 | 73 | 367 | 24415 | 9 | 6 | 191 | 154 | 147 |
| Louisiana | 1974 | 434 | 23 | 2 | 10 | 657 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 28234 | 6211 | 334 | 28 | 141 | 9402 | 3 | 2 | 73 | 59 | 56 |
| Missouri | 8323 | 1831 | 98 | 8 | 42 | 2772 | 1 | 1 | 22 | 17 | 17 |
| Montana | 49791 | 10954 | 589 | 50 | 249 | 16580 | 6 | 4 | 129 | 105 | 100 |
| Nebraska | 13862 | 3050 | 164 | 14 | 69 | 4616 | 2 | 1 | 36 | 29 | 28 |
| New Mexico | 41177 | 9059 | 487 | 41 | 206 | 13712 | 5 | 4 | 107 | 86 | 82 |
| North Dakota | 39127 | 8608 | 463 | 39 | 196 | 13029 | 5 | 3 | 102 | 82 | 78 |
| Ohio | 28808 | 4578 | 246 | 21 | 104 | 6929 | 2 | 2 | 54 | 44 | 42 |
| Oklahoma | 8002 | 1760 | 95 | 8 | 40 | 2665 | 1 | 1 | 21 | 17 | 16 |
| Pennsylvania | -3320 | -730 | -39 | -3 | -17 | -1106 | 0 | 0 | -9 | -7 | -7 |
| South Dakota | 16004 | 3521 | 189 | 16 | 80 | 5329 | 2 | 1 | 42 | 34 | 32 |
| Tennessee | 61486 | 13527 | 727 | 61 | 307 | 20475 | 7 | 5 | 160 | 129 | 123 |
| Texas | 236150 | 51953 | 2793 | 236 | 1181 | 78638 | 28 | 20 | 614 | 496 | 472 |
| Utah | 20691 | 4552 | 245 | 21 | 103 | 6890 | 2 | 2 | 54 | 43 | 41 |
| Virginia | 25026 | 5506 | 296 | 25 | 125 | 8334 | 3 | 2 | 65 | 53 | 50 |
| West Virginia | 55687 | 12251 | 659 | 56 | 278 | 18544 | 7 | 5 | 145 | 117 | 111 |
| Wyomi | 75444 | 16598 | 892 | 75 | 377 | 25123 | 9 | 6 | 196 | 158 | 51 |

TABLE H-17. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE INDUSTRY NEED ALTERNATIVE MID LEVEL 1985-1976

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 54845 | 12066 | 649 | 55 | 274 | 18264 | 7 | 5 | 143 | 115 | 110 |
| Arizona | 13999 | 3080 | 166 | 14 | 70 | 4662 | 2 | 1 | 36 | 29 | 28 |
| Arkansas | 70757 | 15567 | 837 | 71 | 354 | 23562 | 8 | 6 | 184 | 149 | 142 |
| Colorado | 38071 | 8376 | 450 | 38 | 190 | 12678 | 5 | 3 | 99 | 80 | 76 |
| Georgia | 38377 | 8443 | 454 | 38 | 192 | 12780 | 5 | 3 | 100 | 81 | 77 |
| Idaho | 17957 | 3951 | 212 | 18 | 90 | 5980 | 2 | 2 | 47 | 38 | 36 |
| Illinois | 99572 | 21906 | 1178 | 100 | 498 | 33157 | 12 | 8 | 259 | 209 | 199 |
| Indiana | 42718 | 9398 | 505 | 43 | 214 | 14225 | 5 | 4 | 111 | 90 | 85 |
| Iowa | 16866 | 3710 | 199 | 17 | 84 | 5616 | 2 | 1 | 44 | 35 | 34 |
| Kansas | -862 | -190 | -10 | -1 | -4 | -287 | 0 | 0 | -2 | -2 | -2 |
| Kentucky | 27545 | 6060 | 326 | 28 | 138 | 9173 | 3 | 2 | 72 | 58 | 55 |
| Louisiana | 1387 | 305 | 16 | 1 | 7 | 462 | 0 | 0 | 4 | 3 | 3 |
| Maryland | 5493 | 1208 | 65 | 5 | 27 | 1829 | 1 | 0 | 14 | 12 | 11 |
| Missouri | 7451 | 1639 | 88 | 7 | 37 | 2481 | 1 | 1 | 19 | 16 | 15 |
| Montana | 58171 | 12798 | 688 | 58 | 291 | 19371 | 7 | 5 | 151 | 122 | 116 |
| Nebraska | 29850 | 6567 | 353 | 30 | 149 | 9940 | 4 | 3 | 78 | 63 | 60 |
| New Mexico | 16065 | 3534 | 190 | 16 | 80 | 5350 | 2 | 1 | 42 | 34 | 32 |
| North Dakota | 21711 | 4776 | 257 | 22 | 109 | 7230 | 3 | 2 | 56 | 46 | 43 |
| Ohio | 36684 | 8071 | 434 | 37 | 183 | 12216 | 4 | 3 | 95 | 77 | 73 |
| Oklahoma | 2354 | 496 | 27 | 2 | 11 | 751 | 0 | 0 | 6 | 5 | 5 |
| Pennsylvania | 127286 | 28003 | 1506 | 127 | 636 | 42386 | 15 | 11 | 331 | 267 | 255 |
| South Dakota | 7405 | 1629 | 88 | 7 | 37 | 2466 | 1 | 1 | 19 | 16 | 15 |
| Tennessee | -7140 | -1571 | -84 | -7 | -36 | -2378 | -1 | -1 | -19 | -15 | -14 |
| Texas | 154698 | 34034 | 1830 | 155 | 773 | 51514 | 19 | 13 | 402 | 325 | 309 |
| Utah | 49582 | 10908 | 586 | 50 | 248 | 16511 | 6 | 4 | 129 | 104 | 99 |
| Virginia | 38561 | 8483 | 456 | 39 | 193 | 12841 | 5 | 3 | 100 | 81 | 77 |
| West Virginia | 31146 | 6852 | 368 | 31 | 156 | 10372 | 4 | 3 | 81 | 65 | 62 |
| Wyoming | 111078 | 24437 | 1314 | 111 | 555 | 36989 | 13 | 9 | 289 | 233 | 222 |

TABLE II-18. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE INDUSTRY NEED ALTERNATIVE MID LEVEL 1990-1995

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 4957 | 1091 | 59 | 5 | 25 | 1651 | 1 | 0 | 13 | 10 | 10 |
| Arizona | 13831 | 3043 | 164 | 14 | 69 | 4606 | 2 | 1 | 36 | 29 | 28 |
| Arkansas | 116719 | 25678 | 1381 | 117 | 584 | 38867 | 14 | 10 | 303 | 245 | 233 |
| Colorado | 68353 | 15016 | 807 | 68 | 341 | 22728 | 8 | 6 | 177 | 143 | 137 |
| Georgia | 24240 | 5333 | 287 | 24 | 121 | 8072 | 3 | 2 | 63 | 51 | 48 |
| Idaho | -8415 | -1891 | -100 | -8 | -42 | -2802 | -1 | -1 | -22 | -18 | -17 |
| Illinois | 175496 | 38609 | 2076 | 175 | 877 | 58440 | 21 | 15 | 456 | 369 | 351 |
| Indiana | 10832 | 2383 | 128 | 11 | 54 | 3607 | 1 | 1 | 28 | 23 | 22 |
| Iowa | 6814 | 1499 | 81 | 7 | 34 | 2269 | 1 | 1 | 18 | 14 | 14 |
| Kansas | 9542 | 2099 | 113 | 10 | 48 | 3178 | 1 | 1 | 25 | 20 | 19 |
| Kentucky | 44421 | 9773 | 525 | 44 | 222 | 14792 | 5 | 4 | 115 | 93 | 89 |
| Louisiana | 2009 | 442 | 24 | 2 | 10 | 669 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 28239 | 6213 | 334 | 28 | 141 | 9403 | 3 | 2 | 73 | 59 | 56 |
| Missouri | 1418 | 312 | 17 | 1 | 7 | 472 | 0 | 0 | 4 | 3 | 3 |
| Montana | 117815 | 25919 | 1394 | 118 | 589 | 39232 | 14 | 10 | 306 | 247 | 236 |
| Nebraska | 15183 | 3340 | 180 | 15 | 76 | 5056 | 2 | 1 | 39 | 32 | 30 |
| New Mexico | 33660 | 7405 | 398 | 34 | 168 | 11209 | 4 | 3 | 88 | 71 | 67 |
| North Dakota | 38852 | 8547 | 460 | 39 | 194 | 12938 | 5 | 3 | 101 | 82 | 78 |
| Ohio | 21058 | 4633 | 249 | 21 | 105 | 7012 | 3 | 2 | 55 | 44 | 42 |
| Oklahoma | 7436 | 1636 | 88 | 7 | 37 | 2476 | 1 | 1 | 19 | 16 | 15 |
| Pennsylvania | -4672 | -1028 | -55 | -5 | -23 | -1556 | -1 | -0 | -12 | -10 | -9 |
| South Dakota | 15096 | 3321 | 179 | 15 | 75 | 5027 | 2 | 1 | 39 | 32 | 30 |
| Tennessee | 72394 | 15927 | 856 | 72 | 362 | 24107 | 9 | 6 | 188 | 152 | 145 |
| Texas | 206886 | 45515 | 2447 | 207 | 1034 | 68893 | 25 | 18 | 538 | 434 | 414 |
| Utah | 18697 | 4113 | 221 | 19 | 93 | 6226 | 2 | 2 | 49 | 39 | 37 |
| Virginia | 26285 | 5783 | 311 | 26 | 131 | 8753 | 3 | 2 | 68 | 55 | 53 |
| West Virginia | 56380 | 12404 | 667 | 56 | 282 | 18775 | 7 | 5 | 147 | 118 | 113 |
| Wyomin | 103122 | 22687 | 1220 | 103 | 516 | 34340 | 12 | 9 | 268 | 217 | 206 |

TABLE II-17. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE STATE DETERMINATION ALTERNATIVE MID LEVEL 1985-1996

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 38423 | 8453 | 454 | 38 | 192 | 12795 | 5 | 3 | 100 | 81 | 77 |
| Arizona | 10489 | 2294 | 123 | 10 | 52 | 3473 | 1 | 1 | 27 | 22 | 21 |
| Arkansas | 66305 | 14587 | 784 | 66 | 332 | 22080 | 8 | 6 | 172 | 139 | 133 |
| Colorado | 33272 | 7320 | 394 | 33 | 166 | 11080 | 4 | 3 | 87 | 70 | 67 |
| Georgia | 38714 | 8517 | 458 | 39 | 194 | 12892 | 5 | 3 | 101 | 81 | 77 |
| Idaho | 16901 | 3718 | 200 | 17 | 85 | 5628 | 2 | 1 | 44 | 35 | 34 |
| Illinois | 118111 | 25984 | 1397 | 118 | 591 | 39331 | 14 | 10 | 307 | 248 | 236 |
| Indiana | 43737 | 9620 | 517 | 44 | 219 | 14561 | 5 | 4 | 114 | 92 | 87 |
| Iowa | 16432 | 3613 | 194 | 16 | 82 | 5469 | 2 | 1 | 43 | 34 | 33 |
| Kansas | -214 | -47 | -3 | 0 | -1 | -71 | 0 | 0 | -1 | 0 | 0 |
| Kentucky | 49803 | 10972 | 590 | 50 | 249 | 16608 | 6 | 4 | 130 | 105 | 100 |
| Louisiana | 1300 | 286 | 15 | 1 | 7 | 433 | 0 | 0 | 3 | 3 | 3 |
| Maryland | 5411 | 1190 | 64 | 5 | 27 | 1802 | 1 | 0 | 14 | 11 | 11 |
| Missouri | 13628 | 3009 | 162 | 14 | 68 | 4555 | 2 | 1 | 36 | 29 | 27 |
| Montana | 52163 | 11476 | 617 | 52 | 261 | 17370 | 6 | 4 | 136 | 110 | 104 |
| Nebraska | 28514 | 6273 | 337 | 29 | 143 | 9495 | 3 | 2 | 74 | 60 | 57 |
| New Mexico | 19375 | 4262 | 229 | 19 | 97 | 6452 | 2 | 2 | 50 | 41 | 39 |
| North Dakota | 21751 | 4785 | 257 | 22 | 109 | 7243 | 3 | 2 | 57 | 46 | 44 |
| Ohio | 36424 | 8013 | 431 | 36 | 182 | 12129 | 4 | 3 | 95 | 76 | 73 |
| Oklahoma | 27933 | 6145 | 330 | 28 | 140 | 9302 | 3 | 2 | 73 | 59 | 56 |
| Pennsylvania | 137352 | 28017 | 1506 | 137 | 637 | 42408 | 15 | 11 | 331 | 267 | 255 |
| South Dakota | 7507 | 1652 | 89 | 8 | 38 | 2500 | 1 | 1 | 20 | 16 | 15 |
| Tennessee | -7084 | -1558 | -84 | -7 | -35 | -2359 | -1 | -1 | -18 | -15 | -14 |
| Texas | 176858 | 38909 | 2092 | 177 | 884 | 58894 | 21 | 15 | 460 | 371 | 354 |
| Utah | 43457 | 9561 | 514 | 43 | 217 | 14471 | 5 | 4 | 113 | 91 | 87 |
| Virginia | 41188 | 9061 | 487 | 41 | 206 | 13715 | 5 | 4 | 107 | 86 | 82 |
| West Virginia | 32599 | 7172 | 386 | 33 | 163 | 10856 | 4 | 3 | 85 | 68 | 65 |
| Wyoming | 61037 | 13428 | 722 | 61 | 305 | 20325 | 7 | 5 | 159 | 128 | 122 |

TABLE II-20. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE STATE DETERMINATION ALTERNATIVE MIDLEVEL 1980-1985

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | -15193 | -3342 | -180 | -15 | -76 | -5059 | -2 | -1 | -40 | -32 | -30 |
| Arizona | 25386 | 5563 | 299 | 25 | 136 | 8420 | 3 | 2 | 66 | 53 | 51 |
| Arkansas | 100852 | 22188 | 1193 | 101 | 504 | 33584 | 12 | 9 | 262 | 212 | 202 |
| Colorado | 60695 | 13353 | 718 | 61 | 303 | 20211 | 7 | 5 | 158 | 127 | 121 |
| Georgia | 22134 | 4869 | 262 | 22 | 111 | 7371 | 3 | 2 | 58 | 46 | 44 |
| Idaho | -9200 | -2024 | -109 | -9 | -46 | -3064 | -1 | -1 | -24 | -19 | -18 |
| Illinois | 243846 | 53646 | 2884 | 244 | 1219 | 81201 | 29 | 21 | 634 | 512 | 488 |
| Indiana | 15198 | 3344 | 180 | 15 | 76 | 5061 | 2 | 1 | 40 | 32 | 30 |
| Iowa | 6089 | 1340 | 72 | 6 | 30 | 2028 | 1 | 1 | 16 | 13 | 12 |
| Kansas | 8471 | 1864 | 100 | 8 | 42 | 2821 | 1 | 1 | 22 | 18 | 17 |
| Kentucky | 116132 | 25549 | 1374 | 116 | 581 | 38672 | 14 | 10 | 302 | 244 | 232 |
| Louisiana | 1841 | 405 | 22 | 2 | 9 | 613 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 28167 | 6197 | 333 | 28 | 141 | 9380 | 3 | 2 | 73 | 59 | 56 |
| Missouri | 21542 | 4739 | 255 | 22 | 108 | 7174 | 3 | 2 | 56 | 45 | 43 |
| Montana | 58650 | 12903 | 694 | 59 | 293 | 19530 | 7 | 5 | 152 | 123 | 117 |
| Nebraska | 12740 | 2803 | 151 | 13 | 64 | 4242 | 2 | 1 | 33 | 27 | 25 |
| New Mexico | 36847 | 8106 | 436 | 37 | 184 | 12270 | 4 | 3 | 96 | 77 | 74 |
| North Dakota | 37291 | 8204 | 441 | 37 | 186 | 12418 | 4 | 3 | 97 | 78 | 75 |
| Ohio | 20675 | 4549 | 245 | 21 | 103 | 6885 | 2 | 2 | 54 | 43 | 41 |
| Oklahoma | -37572 | -8266 | -444 | -38 | -188 | -12511 | -5 | -3 | -98 | -79 | -75 |
| Pennsylvania | 8196 | 1803 | 97 | 8 | 41 | 2729 | 1 | 1 | 21 | 17 | 16 |
| South Dakota | 15025 | 3305 | 178 | 15 | 75 | 5003 | 2 | 1 | 39 | 32 | 30 |
| Tennessee | 52360 | 12619 | 628 | 52 | 287 | 19101 | 7 | 5 | 149 | 120 | 115 |
| Texas | 218259 | 48017 | 2582 | 218 | 1091 | 72680 | 26 | 19 | 567 | 458 | 437 |
| Utah | 11771 | 2590 | 139 | 12 | 59 | 3920 | 1 | 1 | 31 | 25 | 24 |
| Virginia | 23531 | 5177 | 278 | 24 | 118 | 7836 | 3 | 2 | 61 | 49 | 47 |
| West Virginia | 55983 | 12316 | 662 | 56 | 280 | 18642 | 7 | 5 | 146 | 118 | 112 |
| Wyom' | 31814 | 6999 | 376 | 32 | 159 | 10594 | 4 | 3 | 83 | 67 | 64 |

TABLE H-21. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR THE DOE COAL ALTERNATIVE MIDLEVEL 1985-1776

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 38959 | 8571 | 461 | 39 | 195 | 12973 | 5 | 3 | 101 | 82 | 78 |
| Arizona | 13597 | 2991 | 161 | 14 | 68 | 4528 | 2 | 1 | 35 | 29 | 27 |
| Arkansas | 69355 | 15038 | 807 | 68 | 342 | 23762 | 8 | 6 | 178 | 149 | 137 |
| Colorado | 36256 | 7976 | 429 | 36 | 181 | 12573 | 4 | 3 | 94 | 76 | 73 |
| Georgia | 38821 | 8541 | 459 | 39 | 194 | 12927 | 5 | 3 | 101 | 82 | 78 |
| Idaho | 17544 | 3860 | 208 | 18 | 88 | 5842 | 2 | 1 | 46 | 37 | 35 |
| Illinois | 111797 | 24595 | 1322 | 112 | 559 | 37228 | 13 | 10 | 291 | 235 | 224 |
| Indiana | 43447 | 7558 | 514 | 43 | 217 | 14468 | 5 | 4 | 113 | 91 | 87 |
| Iowa | 12724 | 2799 | 151 | 13 | 64 | 4237 | 2 | 1 | 33 | 27 | 25 |
| Kansas | 3570 | 785 | 42 | 4 | 18 | 1189 | 0 | 0 | 9 | 7 | 7 |
| Kentucky | 35266 | 7759 | 417 | 35 | 176 | 11744 | 4 | 3 | 92 | 74 | 71 |
| Louisiana | 1346 | 296 | 16 | 1 | 7 | 448 | 0 | 0 | 4 | 3 | 3 |
| Maryland | 5294 | 1165 | 63 | 5 | 26 | 1763 | 1 | 0 | 14 | 11 | 11 |
| Missouri | 9833 | 2163 | 116 | 10 | 49 | 3274 | 1 | 1 | 26 | 21 | 20 |
| Montana | 52377 | 11523 | 620 | 52 | 262 | 17442 | 6 | 4 | 136 | 110 | 105 |
| Nebraska | 28432 | 6255 | 336 | 28 | 142 | 9468 | 3 | 2 | 74 | 60 | 57 |
| New Mexico | 10899 | 2398 | 129 | 11 | 54 | 3629 | 1 | 1 | 28 | 23 | 22 |
| North Dakota | 14173 | 3118 | 168 | 14 | 71 | 4720 | 2 | 1 | 37 | 30 | 28 |
| Ohio | 11184 | 2461 | 132 | 11 | 56 | 3724 | 1 | 1 | 29 | 23 | 22 |
| Oklahoma | 1856 | 408 | 22 | 2 | 9 | 618 | 0 | 0 | 5 | 4 | 4 |
| Pennsylvania | 127112 | 27965 | 1503 | 127 | 636 | 42328 | 15 | 11 | 330 | 267 | 254 |
| South Dakota | 3116 | 686 | 37 | 3 | 16 | 1038 | 0 | 0 | 8 | 7 | 6 |
| Tennessee | -11557 | -2542 | -137 | -12 | -58 | -3848 | -1 | -1 | -30 | -24 | -23 |
| Texas | 159201 | 35024 | 1883 | 159 | 796 | 53014 | 19 | 14 | 414 | 334 | 318 |
| Utah | 39183 | 8620 | 463 | 39 | 196 | 13048 | 5 | 3 | 102 | 82 | 78 |
| Virginia | -21043 | -4629 | -249 | -21 | -105 | -7007 | -3 | -2 | -55 | -44 | -42 |
| West Virginia | 32303 | 7107 | 382 | 32 | 162 | 10757 | 4 | 3 | 84 | 68 | 65 |
| Wyoming | 103662 | 22806 | 1226 | 104 | 518 | 34520 | 12 | 9 | 270 | 218 | 207 |

TABLE II-22. COAL PRODUCING STATES SOCIOECONOMIC CHARACTERISTICS FOR DOE GOAL ALTERNATIVE MID LEVEL 1990-1995

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | -17779 | -3711 | -210 | -18 | -89 | -5920 | -2 | -2 | -46 | -37 | -36 |
| Arizona | 13087 | 2879 | 155 | 13 | 65 | 4358 | 2 | 1 | 34 | 27 | 26 |
| Arkansas | 80412 | 17691 | 951 | 80 | 402 | 26777 | 10 | 7 | 209 | 169 | 161 |
| Colorado | 61635 | 13559 | 729 | 62 | 308 | 20524 | 7 | 5 | 160 | 129 | 123 |
| Georgia | 22940 | 5047 | 271 | 23 | 115 | 7639 | 3 | 2 | 60 | 48 | 46 |
| Idaho | -8634 | -1700 | -102 | -9 | -43 | -2875 | -1 | -1 | -22 | -18 | -17 |
| Illinois | 211675 | 46569 | 2504 | 212 | 1058 | 70488 | 25 | 18 | 550 | 445 | 423 |
| Indiana | 18442 | 4057 | 218 | 18 | 92 | 6141 | 2 | 2 | 48 | 39 | 37 |
| Iowa | 12352 | 2717 | 146 | 12 | 62 | 4113 | 1 | 1 | 32 | 26 | 25 |
| Kansas | 4498 | 990 | 53 | 4 | 22 | 1498 | 1 | 0 | 12 | 9 | 9 |
| Kentucky | 35521 | 7815 | 420 | 36 | 178 | 11829 | 4 | 3 | 92 | 75 | 71 |
| Louisiana | 1882 | 414 | 22 | 2 | 9 | 627 | 0 | 0 | 5 | 4 | 4 |
| Maryland | 15886 | 3495 | 188 | 16 | 79 | 5290 | 2 | 1 | 41 | 33 | 32 |
| Missouri | 1515 | 333 | 18 | 2 | 8 | 504 | 0 | 0 | 4 | 3 | 3 |
| Montana | 101791 | 22394 | 1204 | 102 | 509 | 33896 | 12 | 9 | 265 | 214 | 204 |
| Nebraska | 12178 | 2679 | 144 | 12 | 61 | 4056 | 1 | 1 | 32 | 26 | 24 |
| New Mexico | 38776 | 8535 | 459 | 39 | 194 | 12919 | 5 | 3 | 101 | 81 | 78 |
| North Dakota | 33415 | 7351 | 395 | 33 | 167 | 11127 | 4 | 3 | 87 | 70 | 67 |
| Ohio | 8017 | 1764 | 95 | 8 | 40 | 2670 | 1 | 1 | 21 | 17 | 16 |
| Oklahoma | 3395 | 725 | 39 | 3 | 16 | 1097 | 0 | 0 | 9 | 7 | 7 |
| Pennsylvania | 7109 | 1564 | 84 | 7 | 36 | 2367 | 1 | 1 | 18 | 15 | 14 |
| South Dakota | 5197 | 1143 | 61 | 5 | 26 | 1731 | 1 | 0 | 14 | 11 | 10 |
| Tennessee | 67876 | 14933 | 803 | 68 | 339 | 22603 | 8 | 6 | 176 | 143 | 136 |
| Texas | 215429 | 47394 | 2548 | 215 | 1077 | 71738 | 26 | 18 | 560 | 452 | 431 |
| Utah | 4547 | 1001 | 54 | 5 | 23 | 1515 | 1 | 0 | 12 | 10 | 9 |
| Virginia | 43656 | 9604 | 516 | 44 | 218 | 14537 | 5 | 4 | 114 | 92 | 87 |
| West Virginia | 51525 | 11336 | 609 | 52 | 258 | 17158 | 6 | 4 | 134 | 108 | 103 |
| Wyo | 92121 | 20267 | 1090 | 92 | 461 | 30676 | 11 | 8 | 240 | 193 | 184 |

TABLE II-23

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1985-1976 HIGH LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 9527 | 2096 | 113 | 10 | 48 | 3172 | 1 | 1 | 25 | 20 | 19 |
| Connecticut/ Massachusetts/ Rhode Island | 7211 | 1587 | 85 | 7 | 36 | 2401 | 1 | 1 | 19 | 15 | 14 |
| Delaware/New Jersey | 566 | 125 | 7 | 1 | 3 | 189 | 0 | 0 | 1 | 1 | 1 |
| Florida | 4886 | 1075 | 58 | 5 | 24 | 1627 | 1 | 0 | 13 | 10 | 10 |
| Maine/New Hampshire/ Vermont | 1423 | 313 | 17 | 1 | 7 | 474 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 15886 | 3495 | 188 | 16 | 79 | 5290 | 2 | 1 | 41 | 33 | 32 |
| Minnesota/Wisconsin | 24623 | 5417 | 291 | 25 | 123 | 8199 | 3 | 2 | 64 | 52 | 49 |
| Mississippi | 1010 | 222 | 12 | 1 | 5 | 336 | 0 | 0 | 3 | 2 | 2 |
| Nevada | -4687 | -1031 | -55 | -5 | -23 | -1561 | -1 | 0 | -12 | -10 | -9 |
| New York | 8231 | 1809 | 97 | 8 | 41 | 2738 | 1 | 1 | 21 | 17 | 16 |
| North Carolina/ South Carolina | 10848 | 2386 | 128 | 11 | 54 | 3612 | 1 | 1 | 28 | 23 | 22 |
| Oregon/Washington | 867 | 191 | 10 | 1 | 4 | 289 | 0 | 0 | 2 | 2 | 2 |

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TABLE N-24

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1990-1995 HIGH LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 39142 | 8611 | 463 | 39 | 196 | 13034 | 5 | 3 | 102 | 82 | 78 |
| Connecticut/ Massachusetts/ Rhode Island | 33323 | 7331 | 394 | 33 | 167 | 11097 | 4 | 3 | 87 | 70 | 67 |
| Delaware/New Jersey | 7247 | 1594 | 86 | 7 | 36 | 2413 | 1 | 1 | 19 | 15 | 14 |
| Florida | 60812 | 13379 | 719 | 61 | 304 | 20251 | 7 | 5 | 158 | 128 | 122 |
| Maine/New Hampshire/ Vermont | 4483 | 986 | 53 | 4 | 22 | 1493 | 1 | 0 | 12 | 9 | 9 |
| Michigan | 61159 | 13455 | 723 | 61 | 306 | 20366 | 7 | 5 | 159 | 128 | 122 |
| Minnesota/Wisconsin | 29748 | 6545 | 352 | 30 | 149 | 9906 | 4 | 3 | 77 | 62 | 59 |
| Mississippi | 2361 | 519 | 28 | 2 | 12 | 786 | 0 | 0 | 6 | 5 | 5 |
| Nevada | 984 | 217 | 12 | 1 | 5 | 328 | 0 | 0 | 3 | 2 | 2 |
| New York | 10440 | 2297 | 123 | 10 | 52 | 3476 | 1 | 1 | 27 | 22 | 21 |
| North Carolina/ South Carolina | 18640 | 4101 | 220 | 19 | 93 | 6207 | 2 | 2 | 48 | 39 | 37 |
| Oregon/Washington | 4539 | 999 | 54 | 5 | 23 | 1511 | 1 | 0 | 12 | 10 | 9 |

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TABLE M-25

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1985-1996 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 5768 | 1269 | 68 | 6 | 29 | 1921 | 1 | 0 | 15 | 12 | 12 |
| Connecticut/ Massachusetts/ Rhode Island | 6956 | 1530 | 82 | 7 | 35 | 2316 | 1 | 1 | 18 | 15 | 14 |
| Delaware/New Jersey | -806 | -177 | -10 | -1 | -4 | -268 | 0 | 0 | -2 | -2 | -2 |
| Florida | 5176 | 1139 | 61 | 5 | 26 | 1724 | 1 | 0 | 13 | 11 | 10 |
| Maine/New Hampshire/ Vermont | 1423 | 313 | 17 | 1 | 7 | 474 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 6406 | 1409 | 76 | 6 | 32 | 2133 | 1 | 1 | 17 | 13 | 13 |
| Minnesota/Wisconsin | 22761 | 5007 | 269 | 23 | 114 | 7580 | 3 | 2 | 59 | 48 | 46 |
| Mississippi | 372 | 82 | 4 | 0 | 2 | 124 | 0 | 0 | 1 | 1 | 1 |
| Nevada | -4717 | -1038 | -56 | -5 | -24 | -1571 | -1 | 0 | -12 | -10 | -9 |
| New York | 7558 | 1663 | 89 | 8 | 38 | 2517 | 1 | 1 | 20 | 16 | 15 |
| North Carolina/ South Carolina | 8879 | 1953 | 105 | 9 | 44 | 2957 | 1 | 1 | 23 | 19 | 18 |
| Oregon/Washington | 382 | 84 | 5 | 0 | 2 | 127 | 0 | 0 | 1 | 1 | 1 |

TABLE II-26

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1990 - 1985 M10 LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 12520 | 2755 | 148 | 13 | 63 | 4169 | 2 | 1 | 33 | 26 | 25 |
| Connecticut/ Massachusetts/ Rhode Island | 6390 | 1406 | 76 | 6 | 32 | 2128 | 1 | 1 | 17 | 13 | 13 |
| Delaware/New Jersey | 2830 | 623 | 33 | 3 | 14 | 943 | 0 | 0 | 7 | 6 | 6 |
| Florida | 46507 | 10232 | 550 | 47 | 233 | 15487 | 6 | 4 | 121 | 98 | 93 |
| Maine/New Hampshire/ Vermont | 576 | 127 | 7 | 1 | 3 | 192 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 34649 | 7623 | 410 | 35 | 173 | 11538 | 4 | 3 | 90 | 73 | 69 |
| Minnesota/Wisconsin | -16432 | -3615 | -194 | -16 | -82 | -5472 | -2 | -1 | -43 | -35 | -33 |
| Mississippi | 1306 | 287 | 15 | 1 | 7 | 435 | 0 | 0 | 3 | 3 | 3 |
| Nevada | 143 | 31 | 2 | 0 | 1 | 48 | 0 | 0 | 0 | 0 | 0 |
| New York | 45711 | 10056 | 541 | 46 | 229 | 15222 | 5 | 4 | 119 | 96 | 91 |
| North Carolina/ South Carolina | -23817 | -5240 | -282 | -24 | -119 | -7931 | -3 | -2 | -62 | -50 | -48 |
| Oregon/Washington | 41208 | 9066 | 487 | 41 | 206 | 13722 | 5 | 4 | 107 | 87 | 82 |

TABLE II-27

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1985-1976 LOW LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 4070 | 895 | 48 | 4 | 20 | 1355 | 0 | 0 | 11 | 9 | 8 |
| Connecticut/ Massachusetts/ Rhode Island | 5482 | 1206 | 65 | 5 | 27 | 1826 | 1 | 0 | 14 | 12 | 11 |
| Delaware/New Jersey | -275 | -61 | -3 | 0 | -1 | -92 | 0 | 0 | -1 | -1 | -1 |
| Florida | 1703 | 375 | 20 | 2 | 9 | 567 | 0 | 0 | 4 | 4 | 3 |
| Maine/New Hampshire/ Vermont | 571 | 126 | 7 | 1 | 3 | 190 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 9022 | 1985 | 107 | 9 | 45 | 3004 | 1 | 1 | 23 | 19 | 18 |
| Minnesota/Wisconsin | 8593 | 1891 | 102 | 9 | 43 | 2862 | 1 | 1 | 22 | 18 | 17 |
| Mississippi | 1030 | 227 | 12 | 1 | 5 | 343 | 0 | 0 | 3 | 2 | 2 |
| Nevada | -4886 | -1075 | -58 | -5 | -24 | -1627 | -1 | 0 | -13 | -10 | -10 |
| New York | 6355 | 1398 | 75 | 6 | 32 | 2116 | 1 | 1 | 17 | 13 | 13 |
| North Carolina/ South Carolina | 6574 | 1446 | 78 | 7 | 33 | 2189 | 1 | 1 | 17 | 14 | 13 |
| Oregon/Washington | 724 | 159 | 9 | 1 | 4 | 241 | 0 | 0 | 2 | 2 | 1 |

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CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE PREFERRED ALTERNATIVE

1990-1995 LOW LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 627 | 138 | 7 | 1 | 3 | 209 | 0 | 0 | 2 | 1 | 1 |
| Connecticut/ Massachusetts/ Rhode Island | 25 | 4 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| Delaware/New Jersey | -306 | -67 | -4 | 0 | -2 | -102 | 0 | 0 | -1 | -1 | -1 |
| Florida | 11959 | 2631 | 141 | 12 | 60 | 3983 | 1 | 1 | 31 | 25 | 24 |
| Maine/New Hampshire/ Vermont | 5 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Michigan | 7517 | 1654 | 89 | 8 | 38 | 2503 | 1 | 1 | 20 | 16 | 15 |
| Minnesota/Wisconsin | 10649 | 2343 | 126 | 11 | 53 | 3546 | 1 | 1 | 28 | 22 | 21 |
| Mississippi | 428 | 94 | 5 | 0 | 2 | 143 | 0 | 0 | 1 | 1 | 1 |
| Nevada | 597 | 131 | 7 | 1 | 3 | 199 | 0 | 0 | 3 | 1 | 1 |
| New York | -734 | -162 | -9 | -1 | -4 | -245 | 0 | 0 | -2 | -2 | -1 |
| North Carolina/ South Carolina | -1428 | -314 | -17 | -1 | -7 | -476 | 0 | 0 | -4 | -3 | -3 |
| Oregon/Washington | 11511 | 2532 | 136 | 12 | 58 | 3833 | 1 | 1 | 30 | 24 | 23 |

TABLE II-29

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE

1985-1976 HIGH LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 9,517 | 2,094 | 113 | 10 | 48 | 3,169 | 1 | 1 | 25 | 20 | 19 |
| Connecticut/ Massachusetts/ Rhode Island | 7,206 | 1,585 | 85 | 7 | 36 | 2,400 | 1 | 1 | 19 | 15 | 14 |
| Delaware/New Jersey | 556 | 122 | 7 | 1 | 3 | 185 | 0 | 0 | 1 | 1 | 1 |
| Florida | 4,870 | 1,072 | 58 | 5 | 24 | 1,622 | 1 | 0 | 13 | 10 | 10 |
| Maine/New Hampshire/ Vermont | 1,423 | 313 | 17 | 1 | 7 | 474 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 15,285 | 3,363 | 181 | 15 | 76 | 5,090 | 2 | 1 | 40 | 32 | 31 |
| Minnesota/Wisconsin | 23,598 | 5,191 | 279 | 24 | 118 | 7,858 | 3 | 2 | 61 | 50 | 47 |
| Mississippi | 877 | 193 | 10 | 1 | 4 | 292 | 0 | 0 | 2 | 2 | 2 |
| Nevada | -4,697 | -1,033 | -56 | -5 | -23 | -1,564 | -1 | 0 | -12 | -10 | -9 |
| New York | 8,216 | 1,808 | 97 | 8 | 41 | 2,736 | 1 | 1 | 21 | 17 | 16 |
| North Carolina/ South Carolina | 10,812 | 2,379 | 128 | 11 | 54 | 3,600 | 1 | 1 | 28 | 23 | 22 |
| Oregon/Washington | 265 | 58 | 3 | 0 | 1 | 88 | 0 | 0 | 1 | 1 | 1 |

TABLE N-3.

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE No LEASING ALTERNATIVE

1990-1995 High LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 7,512 | 1,653 | 89 | 8 | 38 | 2,502 | 1 | 1 | 20 | 16 | 15 |
| Connecticut/ Massachusetts/ Rhode Island | 6,008 | 1,322 | 71 | 6 | 30 | 2,001 | 1 | 1 | 16 | 13 | 12 |
| Delaware/New Jersey | 755 | 166 | 9 | 1 | 4 | 251 | 0 | 0 | 2 | 2 | 2 |
| Florida | 47,012 | 10,343 | 556 | 47 | 235 | 15,655 | 6 | 4 | 122 | 99 | 94 |
| Maine/New Hampshire/ Vermont | 576 | 127 | 7 | 1 | 3 | 192 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 17,804 | 3,917 | 211 | 18 | 89 | 5,929 | 2 | 2 | 46 | 37 | 36 |
| Minnesota/Wisconsin | -15,575 | -3,427 | -184 | -16 | -78 | -5,187 | -2 | -1 | -40 | -33 | -31 |
| Mississippi | 352 | 77 | 4 | 0 | 2 | 117 | 0 | 0 | 1 | 1 | 1 |
| Nevada | -56 | -12 | -1 | 0 | 0 | -19 | 0 | 0 | 0 | 0 | 0 |
| New York | 43,421 | 9,553 | 514 | 43 | 217 | 14,459 | 5 | 4 | 113 | 91 | 87 |
| North Carolina/ South Carolina | -26,897 | -5,917 | -318 | -27 | -134 | -8,957 | -3 | -2 | -70 | -56 | -54 |
| Oregon/Washington | 33,782 | 7,432 | 400 | 34 | 169 | 11,250 | 4 | 3 | 88 | 71 | 68 |

TABLE H-31

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE NO LICENSING ALTERNATIVE

1985-1976 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 5,763 | 1,268 | 68 | 6 | 29 | 1,919 | 1 | 0 | 15 | 12 | 12 |
| Connecticut/ Massachusetts/ Rhode Island | 6,956 | 1,530 | 82 | 7 | 35 | 2,316 | 1 | 1 | 18 | 15 | 14 |
| Delaware/New Jersey | -806 | -177 | -10 | -1 | -4 | -268 | 0 | 0 | -2 | -2 | -2 |
| Florida | 5,171 | 1,138 | 61 | 5 | 26 | 1,722 | 1 | 0 | 13 | 11 | 10 |
| Maine/New Hampshire/ Vermont | 1,418 | 312 | 17 | 1 | 7 | 472 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 5,819 | 1,280 | 69 | 6 | 29 | 1,938 | 1 | 0 | 15 | 12 | 12 |
| Minnesota/Wisconsin | 21,802 | 4,797 | 258 | 22 | 109 | 7,260 | 3 | 2 | 57 | 46 | 44 |
| Mississippi | 484 | 107 | 6 | 0 | 2 | 161 | 0 | 0 | 1 | 1 | 1 |
| Nevada | -4,723 | -1,039 | -56 | -5 | -24 | -1,573 | -1 | 0 | -12 | -10 | -9 |
| New York | 7,558 | 1,663 | 89 | 8 | 38 | 2,517 | 1 | 1 | 20 | 16 | 15 |
| North Carolina/ South Carolina | 8,869 | 1,951 | 105 | 9 | 44 | 2,953 | 1 | 1 | 23 | 19 | 18 |
| Oregon/Washington | -102 | -22 | -1 | 0 | -1 | -34 | 0 | 0 | 0 | 0 | 0 |

TABLE II-32

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE No LEASING ALTERNATIVE

1990-1995 MID LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 12,337 | 2,714 | 146 | 12 | 62 | 4,108 | 1 | 1 | 32 | 26 | 25 |
| Connecticut/ Massachusetts/ Rhode Island | 6,385 | 1,405 | 76 | 6 | 32 | 2,126 | 1 | 1 | 17 | 13 | 13 |
| Delaware/New Jersey | 2,815 | 619 | 33 | 3 | 14 | 937 | 0 | 0 | 7 | 6 | 6 |
| Florida | 46,486 | 10,227 | 550 | 46 | 232 | 15,480 | 6 | 4 | 121 | 98 | 93 |
| Maine/New Hampshire/ Vermont | 576 | 127 | 7 | 1 | 3 | 192 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 29,682 | 6,530 | 351 | 30 | 148 | 9,884 | 4 | 3 | 77 | 62 | 59 |
| Minnesota/Wisconsin | -15,285 | -3,363 | -181 | -15 | -76 | -5,040 | -2 | -1 | -40 | -32 | -31 |
| Mississippi | 1,112 | 245 | 13 | 1 | 6 | 370 | 0 | 0 | 3 | 2 | 2 |
| Nevada | -46 | -10 | -1 | 0 | 0 | -15 | 0 | 0 | 0 | 0 | 0 |
| New York | 45,706 | 10,055 | 541 | 46 | 229 | 15,220 | 5 | 4 | 119 | 96 | 91 |
| North Carolina/ South Carolina | -23,858 | -5,249 | -282 | -24 | -119 | -7,945 | -3 | -2 | -62 | -50 | -48 |
| Oregon/Washington | 33,415 | 7,351 | 395 | 33 | 167 | 11,127 | 4 | 3 | 87 | 70 | 67 |

TABLE II-33

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE NO LEASING ALTERNATIVE

1985-1996 LOW LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 4,075 | 896 | 48 | 4 | 20 | 1,357 | 0 | 0 | 11 | 9 | 8 |
| Connecticut/ Massachusetts/ Rhode Island | 5,488 | 1,207 | 65 | 5 | 27 | 1,827 | 1 | 0 | 14 | 12 | 11 |
| Delaware/New Jersey | -275 | -61 | -3 | 0 | -1 | -92 | 0 | 0 | -1 | -1 | -1 |
| Florida | 1,708 | 376 | 20 | 2 | 9 | 569 | 0 | 0 | 4 | 4 | 3 |
| Maine/New Hampshire/ Vermont | 571 | 126 | 7 | 1 | 3 | 190 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 9,022 | 1,985 | 107 | 9 | 45 | 3,004 | 1 | 1 | 23 | 19 | 18 |
| Minnesota/Wisconsin | 10,445 | 2,298 | 124 | 10 | 52 | 3,478 | 1 | 1 | 27 | 22 | 21 |
| Mississippi | 1,030 | 227 | 12 | 1 | 5 | 343 | 0 | 0 | 3 | 2 | 2 |
| Nevada | -4,886 | -1,075 | -58 | -5 | -24 | -1,627 | -1 | 0 | -13 | -10 | -10 |
| New York | 6,355 | 1,398 | 75 | 6 | 32 | 2,116 | 1 | 1 | 17 | 13 | 13 |
| North Carolina/ South Carolina | 6,579 | 1,447 | 78 | 7 | 33 | 2,191 | 1 | 1 | 17 | 14 | 13 |
| Oregon/Washington | 734 | 159 | 9 | 1 | 4 | 241 | 0 | 0 | 2 | 2 | 1 |

TABLE II-34

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE No LEASING ALTERNATIVE

1990-1995 Low LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 622 | 137 | 7 | 1 | 3 | 207 | 0 | 0 | 2 | 1 | 1 |
| Connecticut/ Massachusetts/ Rhode Island | 25 | 6 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| Delaware/New Jersey | -311 | -68 | -4 | 0 | -2 | -104 | 0 | 0 | -1 | -1 | -1 |
| Florida | 11,954 | 2,680 | 141 | 12 | 60 | 3,981 | 1 | 1 | 31 | 25 | 24 |
| Maine/New Hampshire/ Vermont | 5 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Michigan | 7,334 | 1,613 | 87 | 7 | 37 | 2,442 | 1 | 1 | 19 | 15 | 15 |
| Minnesota/Wisconsin | 8,721 | 1,919 | 103 | 9 | 44 | 2,904 | 1 | 1 | 23 | 18 | 17 |
| Mississippi | 423 | 93 | 5 | 0 | 2 | 141 | 0 | 0 | 1 | 1 | 1 |
| Nevada | 597 | 131 | 7 | 1 | 3 | 199 | 0 | 0 | 2 | 1 | 1 |
| New York | -739 | -163 | -9 | -1 | -4 | -246 | 0 | 0 | -2 | -2 | -1 |
| North Carolina/ South Carolina | -1,438 | -316 | -17 | -1 | -7 | -479 | 0 | 0 | -4 | -3 | -3 |
| Oregon/Washington | 10,950 | 2,409 | 130 | 11 | 55 | 3,646 | 1 | 1 | 28 | 23 | 22 |

TABLE H-35

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE Preference Right Leasing Alternative

1985-1976 Mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 5727 | 1260 | 68 | 6 | 29 | 1907 | 1 | 0 | 15 | 12 | 11 |
| Connecticut/ Massachusetts/ Rhode Island | 6956 | 1530 | 82 | 7 | 35 | 2316 | 1 | 1 | 18 | 15 | 14 |
| Delaware/New Jersey | -806 | -177 | -10 | -1 | -4 | -268 | 0 | 0 | -2 | -2 | -2 |
| Florida | 5243 | 1153 | 62 | 5 | 26 | 1746 | 1 | 0 | 14 | 11 | 10 |
| Maine/New Hampshire/ Vermont | 1418 | 312 | 17 | 1 | 7 | 472 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 5839 | 1285 | 69 | 6 | 29 | 1945 | 1 | 0 | 15 | 12 | 12 |
| Minnesota/Wisconsin | 21853 | 4808 | 258 | 22 | 109 | 7277 | 3 | 2 | 57 | 46 | 44 |
| Mississippi | 459 | 101 | 5 | 0 | 2 | 153 | 0 | 0 | 1 | 1 | 1 |
| Nevada | -4768 | -1049 | -56 | -5 | -24 | -1588 | -1 | 0 | -12 | -10 | -10 |
| New York | 7558 | 1663 | 89 | 8 | 38 | 2517 | 1 | 1 | 20 | 16 | 15 |
| North Carolina/ South Carolina | 8874 | 1957 | 105 | 9 | 44 | 2962 | 1 | 1 | 23 | 19 | 18 |
| Oregon/Washington | -76 | -17 | -1 | 0 | 0 | -25 | 0 | 0 | 0 | 0 | 0 |

TABLE II-34

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE Preference Right Leasing Alternative

1990-1985 mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 12551 | 2741 | 148 | 13 | 61 | 4180 | 2 | 1 | 93 | 26 | 25 |
| Connecticut/ Massachusetts/ Rhode Island | 6390 | 1406 | 76 | 6 | 32 | 2128 | 1 | 1 | 17 | 13 | 13 |
| Delaware/New Jersey | 2820 | 620 | 33 | 3 | 14 | 939 | 0 | 0 | 7 | 6 | 6 |
| Florida | 46548 | 10290 | 551 | 47 | 233 | 15500 | 6 | 4 | 121 | 98 | 93 |
| Maine/New Hampshire/ Vermont | 576 | 127 | 7 | 1 | 3 | 192 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 29636 | 6520 | 351 | 30 | 148 | 9869 | 4 | 3 | 77 | 62 | 59 |
| Minnesota/Wisconsin | -15606 | -3433 | -185 | -16 | -78 | -5197 | -2 | -1 | -41 | -33 | -31 |
| Mississippi | 1209 | 266 | 14 | 1 | 6 | 402 | 0 | 0 | 3 | 3 | 2 |
| Nevada | 178 | 39 | 2 | 0 | 1 | 59 | 0 | 0 | 0 | 0 | 0 |
| New York | 45706 | 10055 | 541 | 46 | 239 | 15210 | 5 | 4 | 119 | 96 | 91 |
| North Carolina/ South Carolina | -23812 | -5239 | -282 | -24 | -119 | -7929 | -3 | -2 | -62 | -50 | -48 |
| Oregon/Washington | 33456 | 7360 | 396 | 33 | 167 | 11141 | 4 | 3 | 87 | 70 | 67 |

TABLE A-37

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE Short Term leasing Alternative

1985-1976 mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 5,727 | 1,260 | 68 | 6 | 29 | 1,907 | 1 | 0 | 15 | 12 | 11 |
| Connecticut/ Massachusetts/ Rhode Island | 6,956 | 1,530 | 82 | 7 | 35 | 2,316 | 1 | 1 | 18 | 15 | 14 |
| Delaware/New Jersey | -806 | -177 | -10 | -1 | -4 | -268 | 0 | 0 | -2 | -2 | -2 |
| Florida | 5,227 | 1,150 | 62 | 5 | 26 | 1,741 | 1 | 0 | 14 | 11 | 10 |
| Maine/New Hampshire/ Vermont | 1,418 | 312 | 17 | 1 | 7 | 472 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 6,023 | 1,325 | 71 | 6 | 30 | 2,006 | 1 | 1 | 16 | 13 | 12 |
| Minnesota/Wisconsin | 22,139 | 4,871 | 262 | 22 | 111 | 7,372 | 3 | 2 | 58 | 46 | 44 |
| Mississippi | 449 | 99 | 5 | 0 | 2 | 149 | 0 | 0 | 1 | 1 | 1 |
| Nevada | -4,758 | -1,047 | -56 | -5 | -24 | -1,585 | -1 | 0 | -12 | -10 | -10 |
| New York | 7,558 | 1,663 | 89 | 8 | 38 | 2,517 | 1 | 1 | 20 | 16 | 15 |
| North Carolina/ South Carolina | 8,905 | 1,959 | 105 | 9 | 45 | 2,965 | 1 | 1 | 23 | 19 | 18 |
| Oregon/Washington | 56 | 12 | 1 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 0 |

TABLE II-3F

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE Short Term Leasing Alternative

1990-1985 Mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 12337 | 2714 | 146 | 12 | 62 | 4108 | 1 | 1 | 32 | 26 | 25 |
| Connecticut/ Massachusetts/ Rhode Island | 6385 | 1405 | 76 | 6 | 32 | 2126 | 1 | 1 | 17 | 13 | 13 |
| Delaware/New Jersey | 2820 | 620 | 33 | 3 | 14 | 939 | 0 | 0 | 7 | 6 | 6 |
| Florida | 46395 | 10207 | 549 | 46 | 232 | 15449 | 6 | 4 | 121 | 97 | 93 |
| Maine/New Hampshire/ Vermont | 576 | 127 | 7 | 1 | 3 | 192 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 29932 | 6585 | 354 | 30 | 150 | 9967 | 4 | 3 | 78 | 63 | 60 |
| Minnesota/Wisconsin | -15677 | -3449 | -185 | -16 | -78 | -5221 | -2 | -1 | -41 | -33 | -31 |
| Mississippi | 1147 | 252 | 14 | 1 | 6 | 382 | 0 | 0 | 3 | 2 | 2 |
| Nevada | 102 | 22 | 1 | 0 | 1 | 34 | 0 | 0 | 0 | 0 | 0 |
| New York | 45706 | 10055 | 541 | 46 | 229 | 15220 | 5 | 4 | 119 | 96 | 91 |
| North Carolina/ South Carolina | -23853 | -5248 | -282 | -24 | -119 | -7943 | -3 | -2 | -62 | -50 | -48 |
| Oregon/Washington | 34144 | 7512 | 404 | 34 | 171 | 11370 | 4 | 3 | 89 | 72 | 68 |

TABLE II-37

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE Industry Needs Alternative

1985-1996 Mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 5717 | 1258 | 68 | 6 | 29 | 1904 | 1 | 0 | 15 | 12 | 11 |
| Connecticut/ Massachusetts/ Rhode Island | 6961 | 1532 | 82 | 7 | 35 | 2318 | 1 | 1 | 18 | 15 | 14 |
| Delaware/New Jersey | -785 | -173 | -9 | -1 | -4 | -262 | 0 | 0 | -2 | -2 | -2 |
| Florida | 5207 | 1146 | 62 | 5 | 26 | 1734 | 1 | 0 | 14 | 11 | 10 |
| Maine/New Hampshire/ Vermont | 1423 | 313 | 17 | 1 | 7 | 474 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 6661 | 1465 | 79 | 7 | 33 | 2218 | 1 | 1 | 17 | 14 | 13 |
| Minnesota/Wisconsin | 24313 | 5364 | 288 | 24 | 122 | 8120 | 3 | 2 | 63 | 51 | 49 |
| Mississippi | 469 | 103 | 6 | 0 | 2 | 156 | 0 | 0 | 1 | 1 | 1 |
| Nevada | -4738 | -1042 | -56 | -5 | -24 | -1578 | -1 | 0 | -12 | -10 | -9 |
| New York | 7573 | 1666 | 90 | 8 | 38 | 2522 | 1 | 1 | 20 | 16 | 15 |
| North Carolina/ South Carolina | 9012 | 1983 | 107 | 9 | 45 | 3001 | 1 | 1 | 23 | 19 | 18 |
| Oregon/Washington | 515 | 113 | 6 | 1 | 3 | 172 | 0 | 0 | 1 | 1 | 1 |

II-39

TABLE II-48

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE Industry Needs Alternative

1990-1985 Mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 12434 | 2735 | 147 | 12 | 62 | 4140 | 1 | 1 | 32 | 26 | 25 |
| Connecticut/ Massachusetts/ Rhode Island | 4385 | 1405 | 76 | 6 | 32 | 2126 | 1 | 1 | 17 | 13 | 13 |
| Delaware/New Jersey | 2820 | 620 | 33 | 3 | 14 | 939 | 0 | 0 | 7 | 6 | 6 |
| Florida | 46522 | 10235 | 550 | 47 | 233 | 15492 | 6 | 4 | 121 | 98 | 93 |
| Maine/New Hampshire/ Vermont | 576 | 127 | 7 | 1 | 3 | 192 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 35812 | 7879 | 424 | 36 | 179 | 11925 | 4 | 3 | 93 | 75 | 72 |
| Minnesota/Wisconsin | -15820 | -3480 | -187 | -16 | -79 | -5268 | -2 | -1 | -41 | -33 | -32 |
| Mississippi | 1112 | 245 | 13 | 1 | 6 | 370 | 0 | 0 | 3 | 2 | 2 |
| Nevada | 314 | 47 | 3 | 0 | 1 | 71 | 0 | 0 | 1 | 0 | 0 |
| New York | 45706 | 10055 | 541 | 46 | 229 | 15220 | 5 | 4 | 119 | 76 | 91 |
| North Carolina/ South Carolina | -23914 | -5261 | -283 | -24 | -120 | -7963 | -3 | -2 | -62 | -50 | -48 |
| Oregon/Washington | 43432 | 7555 | 514 | 43 | 217 | 14463 | 5 | 4 | 113 | 91 | 87 |

TABLE H-41

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE State Determination Alternative

1985-1976 Mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 5727 | 1260 | 68 | 6 | 29 | 1907 | 1 | 0 | 15 | 12 | 11 |
| Connecticut/ Massachusetts/ Rhode Island | 6952 | 1530 | 82 | 7 | 35 | 2316 | 1 | 1 | 18 | 15 | 14 |
| Delaware/New Jersey | -801 | -176 | -9 | -1 | -4 | -267 | 0 | 0 | -2 | -2 | -2 |
| Florida | 5263 | 1158 | 62 | 5 | 26 | 1753 | 1 | 0 | 14 | 11 | 11 |
| Maine/New Hampshire/ Vermont | 1423 | 313 | 17 | 1 | 7 | 474 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 6411 | 1410 | 76 | 6 | 32 | 2135 | 1 | 1 | 17 | 13 | 13 |
| Minnesota/Wisconsin | 23705 | 5217 | 280 | 24 | 119 | 7897 | 3 | 2 | 62 | 50 | 47 |
| Mississippi | 428 | 94 | 5 | 0 | 2 | 143 | 0 | 0 | 1 | 1 | 1 |
| Nevada | -4738 | -1042 | -56 | -5 | -24 | -1578 | -1 | 0 | -12 | -10 | -9 |
| New York | 7563 | 1664 | 89 | 8 | 38 | 2519 | 1 | 1 | 20 | 16 | 15 |
| North Carolina/ South Carolina | 8889 | 1956 | 105 | 9 | 44 | 2960 | 1 | 1 | 23 | 19 | 18 |
| Oregon/Washington | 331 | 73 | 4 | 0 | 2 | 110 | 0 | 0 | 1 | 1 | 1 |

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TABLE II-42

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE State Determination Alternative

1990-1985 mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 12418 | 2732 | 147 | 12 | 62 | 4135 | 1 | 1 | 32 | 26 | 25 |
| Connecticut/ Massachusetts/ Rhode Island | 4380 | 1404 | 75 | 6 | 32 | 2125 | 1 | 1 | 17 | 13 | 13 |
| Delaware/New Jersey | 2805 | 617 | 33 | 3 | 14 | 734 | 0 | 0 | 7 | 6 | 6 |
| Florida | 46078 | 10137 | 545 | 46 | 230 | 15344 | 6 | 4 | 120 | 97 | 92 |
| Maine/New Hampshire/ Vermont | 576 | 127 | 7 | 1 | 3 | 192 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 30916 | 6802 | 366 | 31 | 155 | 10295 | 4 | 3 | 80 | 65 | 62 |
| Minnesota/Wisconsin | -17386 | -3825 | -206 | -17 | -87 | -5789 | -2 | -1 | -45 | -37 | -35 |
| Misaissippi | 1285 | 283 | 15 | 1 | 6 | 428 | 0 | 0 | 3 | 3 | 3 |
| Nevada | 168 | 37 | 2 | 0 | 1 | 56 | 0 | 0 | 0 | 0 | 0 |
| New York | 45696 | 10053 | 540 | 46 | 228 | 15217 | 5 | 4 | 119 | 96 | 91 |
| North Carolina/ South Carolina | -23710 | -5216 | -280 | -24 | -119 | -7895 | -3 | -2 | -62 | -50 | -47 |
| Oregon/Washington | 35955 | 7910 | 425 | 36 | 180 | 11973 | 4 | 3 | 93 | 76 | 72 |

TABLE N-43

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE DOE Alternative

1985-1996 mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 5737 | 1262 | 68 | 6 | 29 | 1911 | 1 | 0 | 15 | 12 | 11 |
| Connecticut/ Massachusetts/ Rhode Island | 6946 | 1528 | 82 | 7 | 35 | 2313 | 1 | 1 | 18 | 15 | 14 |
| Delaware/New Jersey | -826 | -182 | -10 | -1 | -4 | -275 | 0 | 0 | -2 | -2 | -2 |
| Florida | 5263 | 1158 | 62 | 5 | 26 | 1753 | 1 | 0 | 14 | 11 | 11 |
| Maine/New Hampshire/ Vermont | 1418 | 312 | 17 | 1 | 7 | 472 | 0 | 0 | 4 | 3 | 3 |
| Michigan | 6385 | 1405 | 76 | 6 | 32 | 2136 | 1 | 1 | 17 | 13 | 13 |
| Minnesota/Wisconsin | 21915 | 4821 | 259 | 22 | 110 | 7298 | 3 | 2 | 57 | 46 | 44 |
| Mississippi | 469 | 103 | 6 | 0 | 2 | 156 | 0 | 0 | 1 | 1 | 1 |
| Nevada | -4728 | -1040 | -56 | -5 | -24 | -1574 | -1 | 0 | -12 | -10 | -9 |
| New York | 7548 | 1661 | 89 | 8 | 38 | 2513 | 1 | 1 | 20 | 16 | 15 |
| North Carolina/ South Carolina | 8808 | 1938 | 104 | 9 | 44 | 2933 | 1 | 1 | 23 | 18 | 18 |
| Oregon/Washington | 254 | 55 | 3 | 0 | 1 | 83 | 0 | 0 | 1 | 1 | 0 |

TABLE A-44

CONSUMING REGIONS

SOCIOECONOMIC CHARACTERISTICS FOR THE DoE Alternative

1990 - AB5 Mid LEVEL

| | POPULATION | SCHOOL ENROLLMENT | TEACHERS | PHYSICIANS | HOSPITAL BEDS | HOUSING UNITS | WATER MGD | WASTEWATER MGD | SOLID WASTE TPD | LAW ENFORCEMENT | FIRE PROTECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| California | 12673 | 2788 | 150 | 13 | 63 | 4220 | 2 | 1 | 23 | 27 | 25 |
| Connecticut/ Massachusetts/ Rhode Island | 6385 | 1405 | 76 | 6 | 32 | 2126 | 1 | 1 | 17 | 13 | 13 |
| Delaware/New Jersey | 2815 | 619 | 33 | 3 | 14 | 937 | 0 | 0 | 7 | 6 | 6 |
| Florida | 46481 | 10226 | 550 | 46 | 233 | 15478 | 6 | 4 | 121 | 98 | 93 |
| Maine/New Hampshire/ Vermont | 576 | 127 | 7 | 1 | 3 | 192 | 0 | 0 | 1 | 1 | 1 |
| Michigan | 33815 | 7464 | 401 | 34 | 170 | 11297 | 4 | 3 | 85 | 71 | 68 |
| Minnesota/Wisconsin | -20543 | -4519 | -243 | -21 | -103 | -6841 | -2 | -2 | -53 | -43 | -41 |
| Mississippi | 1530 | 337 | 18 | 2 | 8 | 509 | 0 | 0 | 4 | 3 | 3 |
| Nevada | 321 | 71 | 4 | 0 | 2 | 107 | 0 | 0 | 1 | 1 | 1 |
| New York | 11949 | 3629 | 141 | 12 | 60 | 3979 | 1 | 1 | 31 | 25 | 24 |
| North Carolina/ South Carolina | 13576 | 2987 | 161 | 14 | 68 | 4521 | 2 | 1 | 35 | 29 | 27 |
| Oregon/Washington | 48246 | 10614 | 571 | 48 | 241 | 16066 | 6 | 4 | 125 | 101 | 96 |

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# APPENDIX J

## OPERATING ENERGY FOR THE COAL FUEL CYCLE BY STAGE AND REGION FOR 1976, 1985, 1990

TABLE J-1
OPERATING ENERGY (trillion Btu/year)

N. App.

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1985 | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| Coal Mines: Underground | 2026 | 3152 | 3230 | 3312 | 3151 | 3232 | 3324 | 3233 | 3231 | 3212 | 3229 | 3222 |
| Surface | 1845 | 1433 | 1425 | 1456 | 1432 | 1426 | 1461 | 1426 | 1426 | 1419 | 1424 | 1421 |
| Cleaning: Mechanical | 1799 | 2178 | 2208 | 2260 | 2178 | 2208 | 2268 | 2207 | 2208 | 2195 | 2207 | 2202 |
| Non-Mechanical | 11.3 | 12.9 | 13.1 | 13.4 | 12.8 | 13.1 | 13.4 | 13.1 | 13.1 | 13.0 | 13.1 | 13.0 |
| Transport: Rail | 17.7 | 27.1 | 30.9 | 33.3 | 27.2 | 30.7 | 32.7 | 30.7 | 30.7 | 31.9 | 29.8 | 31.0 |
| Truck | 2.96 | 4.55 | 5.18 | 5.58 | 4.57 | 5.15 | 5.49 | 5.15 | 5.16 | 5.35 | 5.0 | 5.21 |
| Pipeline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barge | 10.9 | 16.8 | 19.1 | 20.6 | 16.9 | 19.0 | 20.3 | 19.0 | 19.0 | 19.7 | 18.5 | 19.2 |
| Conversion: Steam Generation | 77.1 | 95.8 | 92.8 | 98.7 | 95.8 | 92.8 | 98.7 | 92.8 | 92.8 | 92.8 | 81.7 | 92.8 |
| Low-Btu Gas | 0 | 0 | 0 | 1.01 | 0 | 0 | 1.01 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 678 | 841 | 934 | 863 | 841 | 934 | 863 | 934 | 934 | 934 | 868 | 934 |
| TOTAL | 6467 | 7761 | 7958 | 8063 | 7758 | 7960 | 8088 | 7962 | 7960 | 7921 | 7876 | 7941 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 3219 | 3821 | 4525 | 3219 | 3814 | 3767 | 3809 | 3813 | 3782 | 3849 | 3908 |
| Surface | | 1045 | 1021 | 1036 | 1045 | 1019 | 910 | 1018 | 1019 | 1009 | 1041 | 1047 |
| Cleaning: Mechanical | | 2008 | 2327 | 2706 | 2008 | 2323 | 2242 | 2319 | 2322 | 2301 | 2348 | 2386 |
| Non-Mechanical | | 12.1 | 13.7 | 15.7 | 12.1 | 13.7 | 13.3 | 13.6 | 13.7 | 13.6 | 13.8 | 14 |
| Transport: Rail | | 30.5 | 42.9 | 53.2 | 30.5 | 42.1 | 43.1 | 42.4 | 42.2 | 43.4 | 41 | 41.8 |
| Truck | | 5.12 | 7.19 | 8.92 | 5.12 | 7.06 | 7.22 | 7.11 | 7.08 | 7.28 | 6.88 | 7.02 |
| Pipeline | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barge | | 18.9 | 26.5 | 32.9 | 18.9 | 26.1 | 26.7 | 26.2 | 26.1 | 26.9 | 25.4 | 25.7 |
| Conversion: Steam Generation | | 97.2 | 112 | 122 | 97.2 | 112 | 120 | 112 | 112 | 112 | 91.4 | 112 |
| Low-Btu Gas | | 0 | 3.95 | 3.83 | 0 | 3.95 | 2.31 | 3.95 | 3.95 | 3.95 | 3.14 | 3.95 |
| High-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | | 0 | 0 | 1.88 | 0 | 0 | 1.2 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 859 | 932 | 959 | 859 | 932 | 911 | 932 | 932 | 932 | 777 | 932 |
| TOTAL | | 7295 | 8308 | 9515 | 7295 | 8293 | 7844 | 8283 | 8291 | 8230 | 8198 | 8480 |

TABLE J-2

OPERATING ENERGY (trillion Btu/year)

C. App.

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA'e ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1985 | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| Coal Mines: Underground | 2761 | 3216 | 3250 | 2807 | 3216 | 3265 | 2850 | 3267 | 3256 | 3071 | 3236 | 3347 |
| Surface | 1789 | 1243 | 1247 | 1063 | 1243 | 1256 | 1084 | 1256 | 1251 | 1163 | 1239 | 1294 |
| Cleaning: Mechanical | 1775 | 1891 | 1888 | 1594 | 1891 | 1893 | 1612 | 1894 | 1889 | 1809 | 1885 | 1930 |
| Non-Mechanical | 16.2 | 15.1 | 15.3 | 13.3 | 15.1 | 15.4 | 13.6 | 15.4 | 15.4 | 14.3 | 15.2 | 15.9 |
| Transport: Rail | 17.5 | 26.9 | 30.5 | 32.9 | 26.9 | 30.4 | 32.4 | 30.4 | 30.4 | 31.5 | 29.5 | 30.7 |
| Truck | .868 | 1.33 | 1.52 | 1.63 | 1.34 | 1.51 | 1.61 | 1.51 | 1.51 | 1.57 | 1.47 | 1.53 |
| Pipeline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barge | 8.27 | 12.7 | 14.5 | 15.6 | 12.8 | 14.4 | 15.3 | 14.4 | 14.4 | 14.9 | 14.0 | 14.5 |
| Conversion: Steam Generation | 32.6 | 64. | 68.6 | 57.4 | 64 | 68.7 | 57.3 | 68.6 | 68.6 | 68.6 | 35. | 68.6 |
| Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 14.7 | 1.99 | 2.33 | 1.9 | 1.99 | 2.35 | 1.88 | 2.34 | 2.34 | 2.34 | 2.35 | 2.33 |
| TOTAL | 6415 | 6473 | 6517 | 5580 | 6473 | 6547 | 5668 | 6549 | 6528 | 6177 | 6457 | 6705 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 3229 | 3512 | 3712 | 3230 | 3593 | 3355 | 3582 | 3574 | 3435 | 3501 | 3824 |
| Surface | | 978 | 1024 | 1075 | 978 | 1053 | 971 | 1049 | 1046 | 1032 | 1020 | 1135 |
| Cleaning: Mechanical | | 1758 | 1860 | 1984 | 1758 | 1889 | 1797 | 1885 | 1882 | 1828 | 1858 | 1976 |
| Non-Mechanical | | 14.4 | 15.7 | 16.4 | 14.4 | 16.1 | 14.8 | 16.1 | 16.0 | 15.5 | 15.6 | 17.4 |
| Transport: Rail | | 30.2 | 42.4 | 52.6 | 30.2 | 41.7 | 42.6 | 41.9 | 41.8 | 43 | 40.6 | 41.4 |
| Truck | | 1.5 | 2.11 | 2.62 | 1.5 | 2.07 | 2.12 | 2.08 | 2.08 | 2.13 | 2.02 | 2.06 |
| Pipeline | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barge | | 14.3 | 20.1 | 24.9 | 14.3 | 19.7 | 20.2 | 19.8 | 19.8 | 20.3 | 19.2 | 19.6 |
| Conversion: Steam Generation | | 76.4 | 88.9 | 97.7 | 76.4 | 88.9 | 88.1 | 90 | 89 | 89.4 | 66.5 | 87.4 |
| Low-Btu Gas | | 0 | 0 | .892 | 0 | 0 | .646 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | | 0 | 0 | .223 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 1.98 | 2.12 | 5.83 | 1.98 | 2.12 | 9.31 | 2.19 | 2.12 | 2.15 | 2.12 | 3.02 |
| TOTAL | | 6103 | 6567 | 6973 | 6105 | 6706 | 6300 | 6688 | 6673 | 6467 | 6525 | 7105 |

TABLE J-3

OPERATING ENERGY (trillion Btu/year)

S. App.

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETERMINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1985 | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| Coal Mines: Underground | 187 | 203 | 307 | 480 | 203 | 318 | 505 | 307 | 319 | 366 | 259 | 264 |
| Surface | 327 | 193 | 278 | 413 | 193 | 287 | 435 | 276 | 287 | 328 | 228 | 241 |
| Cleaning: Mechanical | 244 | 178 | 282 | 442 | 178 | 292 | 465 | 281 | 292 | 337 | 238 | 242 |
| Non-Mechanical | 1.48 | 1.21 | 1.68 | 2.5 | 1.21 | 1.73 | 2.63 | 1.67 | 1.74 | 1.98 | 1.37 | 1.46 |
| Transport: Rail | 18.2 | 28 | 31.8 | 34.3 | 28.1 | 31.7 | 33.8 | 31.7 | 31.7 | 32.9 | 30.8 | 32.0 |
| Truck | .317 | .487 | .554 | .577 | .488 | .551 | .587 | .551 | .552 | .572 | .535 | .557 |
| Pipeline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barge | .798 | 1.23 | 1.7 | 1.5 | 1.23 | 1.39 | 1.48 | 1.39 | 1.39 | 1.44 | 1.35 | 1.40 |
| Conversion: Steam Generation | 26.2 | 48.2 | 64.3 | 64.7 | 47.2 | 64.6 | 64.4 | 64.7 | 64.5 | 64.3 | 63.3 | 64.5 |
| Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 100 | 132 | 115 | 135 | 125 | 116 | 134 | 116 | 116 | 116 | 117 | 116 |
| TOTAL | 906 | 785 | 1082 | 1574 | 797 | 1114 | 1641 | 1080 | 1114 | 1278 | 939 | 963 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 221 | 362 | 577 | 221 | 376 | 604 | 376 | 376 | 433 | 205 | 202 |
| Surface | | 122 | 197 | 312 | 122 | 205 | 327 | 204 | 204 | 235 | 114 | 111 |
| Cleaning: Mechanical | | 167 | 276 | 441 | 167 | 287 | 463 | 287 | 287 | 331 | 155 | 154 |
| Non-Mechanical | | .974 | 1.56 | 2.48 | .974 | 1.63 | 2.59 | 1.62 | 1.62 | 1.86 | .911 | .886 |
| Transport: Rail | | 31.5 | 44.2 | 54.9 | 31.5 | 43.4 | 44.1 | 43.7 | 43.6 | 44.8 | 42.3 | 43.2 |
| Truck | | .548 | .769 | .954 | .547 | .755 | .773 | .76 | .758 | .779 | .736 | .751 |
| Pipeline | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barge | | 1.38 | 1.94 | 2.41 | 1.38 | 1.9 | 1.95 | 1.92 | 1.91 | 1.96 | 1.85 | 1.89 |
| Conversion: Steam Generation | | 47.9 | 71.7 | 95.8 | 47.9 | 71.8 | 72.9 | 72.4 | 71.8 | 72.1 | 70.8 | 70.8 |
| Low-Btu Gas | | 0 | .524 | 1.15 | 0 | .525 | .839 | .532 | .525 | .528 | .506 | .515 |
| High-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 136 | 141 | 151 | 136 | 141 | 111 | 143 | 141 | 142 | 136 | 139 |
| TOTAL | | 729 | 1097 | 1639 | 729 | 1130 | 1627 | 1131 | 1129 | 1263 | 727 | 724 |

TABLE J-4

OPERATING ENERGY (trillion Btu/year)

E. Int.

| | | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| 1985 | | | | | | | | | | | | | |
| Coal Mines: | Underground | 1213 | 3054 | 3156 | 2524 | 3054 | 3110 | 2711 | 3108 | 3122 | 2935 | 3070 | 3210 |
| | Surface | 1788 | 1544 | 1458 | 1018 | 1544 | 1424 | 1081 | 1424 | 1434 | 1379 | 1405 | 1469 |
| Cleaning: | Mechanical | 1412 | 3129 | 3110 | 2328 | 3129 | 3072 | 2496 | 3070 | 3082 | 2896 | 3040 | 3166 |
| | Non-Mechanical | 6.47 | 8.56 | 8.71 | 6.92 | 8.56 | 6.5 | 7.4 | 8.5 | 8.56 | 8.2 | 8.36 | 8.78 |
| Transport: | Rail | 18 | 27.7 | 31.5 | 34 | 27.8 | 31.4 | 33.5 | 31.4 | 31.4 | 32.6 | 30.5 | 31.7 |
| | Truck | 1.39 | 2.13 | 2.43 | 2.61 | 2.14 | 2.41 | 2.57 | 2.41 | 2.42 | 2.51 | 2.34 | 2.44 |
| | Pipeline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Barge | 9.22 | 14.2 | 16.1 | 17.4 | 14.2 | 16 | 17.1 | 16. | 16 | 16.6 | 15.6 | 16.2 |
| Conversion: | Steam Generation | 60.4 | 82.4 | 85.7 | 90.8 | 82.4 | 85.7 | 90.2 | 85.7 | 85.7 | 86.2 | 83.3 | 85.3 |
| | Low-Btu Gas | 0 | .592 | .563 | 1.7 | .592 | .561 | 1.68 | .561 | .561 | .571 | .58 | .559 |
| | High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Liquefaction | 0 | 0 | .221 | .675 | 0 | .222 | .671 | .221 | .221 | .221 | .222 | .221 |
| | Coke Production | 227 | 325 | 318 | 314 | 325 | 318 | 313 | 318 | 318 | 319 | 321 | 317 |
| TOTAL | | 4736 | 8187 | 8187 | 6339 | 8187 | 8069 | 6755 | 8064 | 8102 | 7876 | 7996 | 8305 |
| 1990 | | | | | | | | | | | | | |
| Coal Mines: | Underground | | 5021 | 5910 | 5283 | 5040 | 6108 | 5399 | 5776 | 6050 | 5294 | 5878 | 6981 |
| | Surface | | 1022 | 1123 | 879 | 1026 | 1185 | 990 | 1142 | 1166 | 966 | 997 | 1404 |
| Cleaning: | Mechanical | | 4306 | 4883 | 4439 | 4323 | 5020 | 4443 | 4743 | 4979 | 4407 | 4950 | 5693 |
| | Non-Mechanical | | 10.5 | 12.7 | 10.5 | 10.5 | 13.3 | 11.5 | 12.7 | 13.2 | 11.1 | 11.7 | 15.7 |
| Transport: | Rail | | 31.2 | 43.8 | 54.4 | 31.2 | 43 | 44 | 43.3 | 43.2 | 44.4 | 41.9 | 42.8 |
| | Truck | | 2.4 | 3.37 | 4.18 | 2.4 | 3.31 | 3.38 | 3.33 | 3.32 | 3.41 | 3.22 | 3.29 |
| | Pipeline | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Barge | | 15.9 | 22.4 | 27.8 | 15.9 | 22 | 22.5 | 22.1 | 22 | 22.7 | 21.4 | 21.8 |
| Conversion: | Steam Generation | | 90.5 | 92.6 | 107 | 90.4 | 92.0 | 86.4 | 92.7 | 92.1 | 92.8 | 92.8 | 91.5 |
| | Low-Btu Gas | | .584 | 2.22 | 4.05 | .583 | 2.2 | 3.18 | 2.22 | 2.2 | 2.22 | 2.22 | 2.19 |
| | High-Btu Gas | | 0 | 0 | 3.08 | 0 | 0 | 1.94 | 0 | 0 | 0 | 0 | 0 |
| | Liquefaction | | .563 | 1.14 | 0 | .552 | 1.14 | 1.87 | 1.14 | 1.14 | 1.14 | 1.14 | 1.13 |
| | Coke Production | | 343 | 340 | 1133 | 343 | 338 | 313 | 340 | 338 | 339 | 342 | 337 |
| TOTAL | | | 10845 | 12434 | 11946 | 10883 | 12828 | 11319 | 12178 | 12911 | 11185 | 12341 | 14593 |

TABLE J-5

OPERATING ENERGY (trillion Btu/year)

W. Int.

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETERMINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1985 | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| Coal Mines: Underground | 7.48 | 68.4 | 114 | 125 | 90 | 119 | 121 | 114 | 119 | 71.4 | 92.3 | 134 |
| Surface | 244 | 209 | 185 | 194 | 209 | 194 | 191 | 187 | 192 | 109 | 145 | 214 |
| Cleaning: Mechanical | 61.8 | 89.2 | 83.1 | 88.1 | 90 | 88.6 | 85.5 | 84.8 | 87.3 | 47.8 | 64.5 | 96.2 |
| Non-Mechanical | .946 | .955 | 1.11 | 1.29 | .967 | 1.16 | 1.34 | 1.11 | 1.16 | .782 | .937 | 1.29 |
| Transport: Rail | 59.6 | 88 | 100 | 108 | 98.3 | 99.6 | 106 | 99.6 | 99.7 | 103 | 96.7 | 101 |
| Truck | .168 | .259 | .294 | .317 | .260 | .293 | .312 | .293 | .293 | .304 | .284 | .296 |
| Pipeline | 8.66 | 13.3 | 15.1 | 16.3 | 13.4 | 15.1 | 16.1 | 15.1 | 15.1 | 15.6 | 14.6 | 15.2 |
| Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | 24.2 | 56.4 | 69.5 | 76.4 | 56.4 | 68.4 | 74.5 | 68.5 | 68.8 | 71.3 | 74.4 | 83 |
| Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 3.39 | 0 | 3.99 | 0 | 0 | 3.95 | 0 | 3.95 | 3.96 | 4.1 | 4.9 | 3.88 |
| TOTAL | 408 | 525 | 572 | 609 | 529 | 590 | 596 | 574 | 588 | 424 | 444 | 649 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 177 | 233 | 172 | 182 | 348 | 343 | 259 | 328 | 131 | 143 | 498 |
| Surface | | 103 | 143 | 136 | 106 | 213 | 242 | 166 | 204 | 93.8 | 79.1 | 272 |
| Cleaning: Mechanical | | 67.4 | 101 | 85.2 | 70 | 150 | 159 | 117 | 142 | 60.9 | 61.4 | 208 |
| Non-Mechanical | | 1.05 | 1.37 | 1.34 | 1.09 | 2.03 | 2.35 | 1.54 | 1.95 | .971 | .818 | 2.51 |
| Transport: Rail | | 99 | 139 | 172 | 98.9 | 136 | 140 | 137 | 137 | 141 | 133 | 136 |
| Truck | | .291 | .409 | .507 | .291 | .402 | .411 | .404 | .403 | .414 | .391 | .399 |
| Pipeline | | 15 | 21. | 26.1 | 15 | 20.7 | 21.1 | 20.8 | 20.7 | 21.3 | 20.1 | 20.5 |
| Barge | | 0 | 0 | .1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | | 61.3 | 115 | 129 | 61.1 | 112 | 112 | 113 | 112 | 118 | 104 | 109 |
| Low-Btu Gas | | .531 | 1.45 | 2.06 | .534 | 1.4 | 1.71 | 1.42 | 1.41 | 1.49 | 1.40 | 1.36 |
| High-Btu Gas | | 0 | 0 | 1.83 | 0 | 0 | 1.26 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 0 | 4.7 | 5.57 | 0 | 4.56 | 4.32 | 4.66 | 4.57 | 4.81 | 4.73 | 4.46 |
| TOTAL | | 524 | 761 | 732 | 535 | 989 | 1027 | 820 | 953 | 574 | 548 | 1251 |

TABLE J-6

OPERATING ENERGY (trillion Btu/year)

Texas Gulf

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETERMINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1985 | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| Coal Mines: Underground | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface | 309 | 1375 | 1459 | 797 | 1373 | 1408 | 1069 | 1401 | 1421 | 1105 | 1269 | 1729 |
| Cleaning: Mechanical | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Mechanical | 2.11 | 9.39 | 9.97 | 5.31 | 9.38 | 9.62 | 7.3 | 9.57 | 9.71 | 7.55 | 8.67 | 11.8 |
| Transport: Rail | 15.5 | 23.8 | 27 | 29.1 | 23.8 | 26.9 | 28.7 | 26.9 | 26.9 | 27.7 | 26.1 | 27.2 |
| Truck | 1.49 | 2.29 | 2.6 | 2.8 | 2.29 | 2.59 | 2.76 | 2.59 | 2.59 | 2.69 | 2.51 | 2.62 |
| Pipeline | 10.3 | 15.9 | 18.1 | 19.5 | 15.9 | 18.0 | 19.2 | 18.0 | 18.0 | 18.7 | 17.5 | 18.2 |
| Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | 10.4 | 58.7 | 89.3 | 82.7 | 58.7 | 88.2 | 83.2 | 88.2 | 88.5 | 87.7 | 88 | 90.8 |
| Low-Btu Gas | 0 | 0 | .797 | .763 | 0 | .791 | .771 | .77 | .792 | .776 | .786 | .813 |
| High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 9.75 | 25 | 23.9 | 21.1 | 25 | 23.7 | 21.3 | 23.7 | 23.7 | 23.3 | 23.6 | 24.4 |
| TOTAL | 359 | 1510 | 1650 | 958 | 1508 | 1578 | 1232 | 1571 | 1591 | 1273 | 1439 | 1904 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface | | 1606 | 1894 | 2200 | 1628 | 2627 | 2176 | 2561 | 2548 | 1296 | 1751 | 2441 |
| Cleaning: Mechanical | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Mechanical | | 11 | 12.9 | 15 | 11.1 | 17.9 | 14.9 | 17.5 | 17.4 | 8.86 | 12 | 16.7 |
| Transport: Rail | | 26.7 | 37.5 | 46.6 | 26.7 | 36.9 | 37.7 | 37.1 | 37.0 | 38 | 35.9 | 36.6 |
| Truck | | 2.57 | 3.61 | 4.48 | 2.57 | 3.55 | 3.63 | 3.57 | 3.56 | 3.66 | 3.46 | 3.53 |
| Pipeline | | 17.9 | 25.1 | 31.1 | 17.9 | 24.6 | 25.2 | 24.8 | 24.7 | 25.4 | 24 | 24.5 |
| Barge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | | 74.4 | 164 | 173 | 74.6 | 161 | 156 | 161 | 161 | 161 | 161 | 161 |
| Low-Btu Gas | | .804 | .843 | 3.01 | .806 | .831 | 3.76 | .831 | .832 | .826 | .83 | .837 |
| High-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 24.3 | 20.4 | 21.6 | 24.4 | 20.1 | 17.8 | 20.1 | 20.1 | 20 | 20.1 | 20.3 |
| TOTAL | | 1764 | 2158 | 2495 | 1786 | 2892 | 2436 | 2826 | 2813 | 1554 | 2009 | 2705 |

TABLE J-7

OPERATING ENERGY (trillion Btu/year)

Powder River

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1985 | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| Coal Mines: Underground | 2.53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface | 820 | 3300 | 4510 | 6600 | 3300 | 4506 | 6050 | 4510 | 4510 | 4950 | 4501 | 4041 |
| Cleaning: Mechanical | 1.27 | 10.8 | 13.1 | 20.6 | 10.8 | 15.5 | 20.5 | 15.5 | 14.7 | 14.4 | 13.1 | 10.8 |
| Non-Mechanical | 5.61 | 21.8 | 30.0 | 43.8 | 21.8 | 29.7 | 39.9 | 29.7 | 29.8 | 33 | 30. | 27.0 |
| Transport: Rail | 13.4 | 20.7 | 23.5 | 25.3 | 20.7 | 23.4 | 24.9 | 23.4 | 23.4 | 24.3 | 22.7 | 23.6 |
| Truck | .244 | .375 | .426 | .459 | .376 | 0.424 | .452 | .424 | .425 | .44 | .412 | .427 |
| Pipeline | 3.06 | 4.7 | 5.35 | 5.76 | 4.72 | 5.32 | 5.67 | 5.32 | 5.33 | 5.52 | 5.17 | 5.38 |
| Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | 4.09 | 12.8 | 10.7 | 11.8 | 12.8 | 10.9 | 11.6 | 10.9 | 10.9 | 11.2 | 9.66 | 10.7 |
| Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | 0 | 0 | 1.21 | 0 | 0 | 1.14 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 851 | 3371 | 4593 | 6709 | 3371 | 4591 | 6154 | 4595 | 4595 | 5039 | 4582 | 4119 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface | | 3850 | 8800 | 13200 | 3850 | 6710 | 7370 | 7810 | 6952 | 9900 | 8714 | 5920 |
| Cleaning: Mechanical | | 11.8 | 21.4 | 28.9 | 12.2 | 21.6 | 23.8 | 27.1 | 21.7 | 24.1 | 21.2 | 13.5 |
| Non-Mechanical | | 25.6 | 59.1 | 89 | 25.5 | 44.4 | 48.8 | 51.5 | 46.1 | 66.5 | 58.5 | 39.8 |
| Transport: Rail | | 23.2 | 32.6 | 40.5 | 23.2 | 32.1 | 32.8 | 32.3 | 32.1 | 33 | 31.2 | 31.8 |
| Truck | | .422 | .592 | .735 | .421 | .581 | .595 | .585 | .583 | .6 | .567 | .578 |
| Pipeline | | 5.29 | 7.43 | 9.22 | 5.28 | 7.29 | 7.46 | 7.34 | 7.31 | 7.52 | 7.11 | 7.25 |
| Barge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | | 15.1 | 8.42 | 13.8 | 15.3 | 8.32 | 15.1 | 8.48 | 8.35 | 8.53 | 6.5 | 8.14 |
| Low-Btu Gas | | 0 | 3.93 | 0 | 0 | 3.93 | 0 | 4.02 | 3.94 | 3.97 | 2.9 | 3.83 |
| High-Btu Gas | | 0 | 2.86 | 1.91 | 0 | 2.57 | 1.88 | 2.57 | 2.6 | 2.94 | 2.9 | 2.68 |
| Liquefaction | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | | 3932 | 8936 | 13384 | 3932 | 6831 | 7500 | 7944 | 7075 | 10047 | 8845 | 6028 |

TABLE J-8

OPERATING ENERGY (trillion Btu/year)

Green River - Hams Fork

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1985 | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| Coal Mines: Underground | 16.9 | 80.8 | 85.2 | 73.5 | 80.8 | 78.4 | 67.5 | 85.2 | 80.1 | 85.2 | 85.2 | 85.2 |
| Surface | 548 | 799 | 1675 | 2987 | 799 | 1594 | 2124 | 1629 | 1614 | 2379 | 2379 | 1180 |
| Cleaning: Mechanical | 37.1 | 62.8 | 89.4 | 100 | 62.8 | 82.5 | 90 | 89.2 | 84.2 | 92.9 | 92.9 | 86.9 |
| Non-Mechanical | 2.43 | 5.31 | 10.8 | 17.9 | 5.31 | 10.3 | 13.6 | 10.5 | 10.4 | 15.3 | 15.3 | 7.66 |
| Transport: Rail | 10.0 | 15.4 | 17.5 | 18.8 | 15.4 | 17.4 | 18.6 | 17.4 | 17.4 | 18.1 | 16.9 | 17.6 |
| Truck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pipeline | 1.43 | 2.19 | 2.5 | 2.69 | 2.2 | 2.48 | 2.65 | 2.48 | 2.49 | 2.58 | 2.41 | 2.51 |
| Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | 5.65 | 10 | 12.2 | 10.8 | 10 | 11.7 | 10.2 | 11.7 | 11.9 | 12.5 | 13.4 | 11.9 |
| Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | .431 | 1.76 | 0 | 0 | 1.76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 623 | 978 | 1892 | 3011 | 978 | 1796 | 2326 | 1845 | 1820 | 2605 | 2605 | 1392 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 93.9 | 180 | 165 | 86.1 | 165 | 150 | 180 | 169 | 180 | 180 | 180 |
| Surface | | 1446 | 2460 | 3685 | 1377 | 2007 | 2468 | 2042 | 2123 | 3120 | 3109 | 1202 |
| Cleaning: Mechanical | | 93.2 | 124 | 132 | 85.7 | 112 | 116 | 122 | 115 | 127 | 127 | 117 |
| Non-Mechanical | | 9.4 | 16.3 | 24.1 | 8.94 | 13.4 | 14.2 | 13.6 | 14.1 | 20.5 | 20.5 | 8.24 |
| Transport: Rail | | 17.3 | 24.3 | 30.1 | 17.3 | 23.9 | 24.4 | 24 | 23.9 | 24.6 | 23.3 | 23.7 |
| Truck | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pipeline | | 2.47 | 3.47 | 4.3 | 2.47 | 3.4 | 3.48 | 3.43 | 3.41 | 3.51 | 3.32 | 3.38 |
| Barge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | | 11.9 | 9.05 | 12.6 | 11.8 | 8.13 | 12. | 8.32 | 8.24 | 9.35 | 9.07 | 8.26 |
| Low-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | | 0 | 2.87 | 0 | 0 | 2.58 | 0 | 2.64 | 2.61 | 2.98 | 2.9 | 2.61 |
| Liquefaction | | 0 | 0 | .125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 2.18 | 0 | 0 | 2.18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | | 1676 | 2820 | 4053 | 1591 | 2335 | 2790 | 2396 | 2460 | 3488 | 3475 | 1545 |

TABLE J-9

OPERATING ENERGY (trillion Btu/year)

Fort Union

| | | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| **1985** | | | | | | | | | | | | | |
| Coal Mines: | Underground | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Surface | 251 | 372 | 702 | 1142 | 372 | 702 | 1142 | 702 | 702 | 812 | 482 | 823 |
| Cleaning: | Mechanical | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Non-Mechanical | 1.34 | 1.77 | 3.51 | 5.84 | 1.77 | 3.51 | 5.84 | 3.51 | 3.51 | 4.09 | 2.35 | 4.15 |
| Transport: | Rail | 16 | 24.6 | 28 | 30.2 | 24.7 | 27.9 | 29.7 | 27.9 | 27.9 | 29 | 27.1 | 28.2 |
| | Truck | .319 | .47 | .558 | .601 | .492 | .555 | .591 | .555 | .555 | .576 | .539 | .561 |
| | Pipeline | 1.23 | 1.89 | 2.15 | 2.32 | 1.9 | 2.14 | 2.28 | 2.14 | 2.15 | 2.22 | 2.08 | 2.17 |
| | Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: | Steam Generation | 7.61 | 13.6 | 8.74 | 19.5 | 13.6 | 8.74 | 19.3 | 8.74 | 8.74 | 9.53 | 7.55 | 9.56 |
| | Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | High-Btu Gas | 0 | 2.78 | 4.05 | 2.88 | 2.78 | 4.05 | 2.85 | 4.05 | 4.05 | 4.05 | 4.05 | 4.05 |
| | Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Coke Production | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | | 278 | 417 | 749 | 1203 | 417 | 749 | 1202 | 749 | 741 | 861 | 525 | 871 |
| **1990** | | | | | | | | | | | | | |
| Coal Mines: | Underground | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Surface | | 482 | 922 | 1802 | 482 | 1122 | 2088 | 1043 | 1113 | 1142 | 495 | 1197 |
| Cleaning: | Mechanical | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Non-Mechanical | | 2.35 | 4.68 | 9.35 | 2.35 | 5.74 | 10.9 | 5.32 | 5.7 | 5.84 | 2.42 | 6.13 |
| Transport: | Rail | | 27.7 | 39 | 48.3 | 27.7 | 38.2 | 39.1 | 38.5 | 38.4 | 39.4 | 37.3 | 38 |
| | Truck | | .552 | .775 | .961 | .551 | .761 | .778 | .765 | .763 | .784 | .741 | .756 |
| | Pipeline | | 2.13 | 2.99 | 3.71 | 2.13 | 2.94 | 3.0 | 2.96 | 2.95 | 3.03 | 2.86 | 2.92 |
| | Barge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: | Steam Generation | | 15.3 | 22.4 | 23.3 | 15.3 | 23.2 | 24.5 | 23 | 23.3 | 24.2 | 19.7 | 23.5 |
| | Low-Btu Gas | | 0 | .775 | 0 | 0 | .694 | 0 | .714 | .71 | .808 | 2.9 | .706 |
| | High-Btu Gas | | 3.12 | 3.75 | 5.52 | 3.1 | 3.64 | 5.24 | 3.7 | 3.66 | 3.8 | 4.05 | 3.6 |
| | Liquefaction | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Coke Production | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | | | 533 | 996 | 1893 | 533 | 1197 | 2171 | 1118 | 1189 | 1220 | 565 | 1272 |

TABLE J-10

OPERATING ENERGY (trillion Btu/year)

San Juan

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETERMINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| 1985 | | | | | | | | | | | | |
| Coal Mines: Underground | .379 | 30 | 29.9 | 65.1 | 30 | 27.9 | 62.8 | 27.9 | 27.9 | 27.4 | 20.1 | 24.5 |
| Surface | 194 | 300 | 520 | 815 | 300 | 518 | 811 | 518 | 518 | 633 | 466 | 680 |
| Cleaning: Mechanical | 23 | 42.1 | 70.1 | 112 | 42.1 | 69 | 110 | 69 | 69 | 81.5 | 60 | 85.5 |
| Non-Mechanical | 1.2 | 2.01 | 3.35 | 5.37 | 2.01 | 3.33 | 5.33 | 3.33 | 3.33 | 4.05 | 2.98 | 4.33 |
| Transport: Rail | 1.37 | 2.1 | 2.39 | 2.57 | 2.11 | 2.38 | 2.53 | 2.38 | 2.38 | 2.47 | 2.31 | 2.4 |
| Truck | .152 | .234 | .266 | .286 | .235 | .265 | .282 | .265 | .265 | .275 | .257 | .267 |
| Pipeline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | 5.34 | 5.65 | 5.85 | 9.33 | 5.65 | 5.85 | 9.26 | 5.81 | 5.81 | 5.81 | 6.31 | 5.81 |
| Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 225 | 382 | 632 | 1009 | 382 | 626 | 1001 | 626 | 626 | 754 | 558 | 802 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 28.5 | 37.8 | 45.1 | 28.5 | 37.3 | 43.3 | 36.3 | 37.1 | 36.2 | 34.4 | 35.6 |
| Surface | | 521 | 1062 | 1605 | 521 | 1269 | 1657 | 1171 | 1248 | 1284 | 1235 | 1350 |
| Cleaning: Mechanical | | 148 | 236 | 301 | 141 | 251 | 298 | 249 | 251 | 262 | 256 | 270 |
| Non-Mechanical | | 4.96 | 8.78 | 12.2 | 4.82 | 9.9 | 12.3 | 9.49 | 9.82 | 10.2 | 9.88 | 10.6 |
| Transport: Rail | | 2.36 | 3.32 | 4.12 | 2.36 | 3.26 | 3.33 | 3.28 | 3.27 | 3.36 | 3.18 | 3.24 |
| Truck | | .263 | .369 | .458 | .263 | .363 | .371 | .365 | .364 | .374 | .353 | .36 |
| Pipeline | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | | 7.03 | .882 | 16.3 | 7.03 | .816 | .986 | .826 | .816 | .849 | 6.02 | .832 |
| Low-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | | 0 | .165 | 0 | 0 | .165 | 0 | .167 | .165 | .165 | 3.1 | .163 |
| Liquefaction | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | | 712 | 1349 | 1984 | 705 | 1572 | 2015 | 1471 | 1550 | 1597 | 1548 | 1671 |

TABLE J-11

OPERATING ENERGY (trillion Btu/year)

Uinta

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| 1985 | | | | | | | | | | | | |
| Coal Mines: Underground | 223 | 279 | 554 | 838 | 279 | 549 | 832 | 554 | 550 | 646 | 488 | 546 |
| Surface | 0 | 51 | 106 | 152 | 51 | 102 | 147 | 106 | 103 | 124 | 93.2 | 100 |
| Cleaning: Mechanical | 99.4 | 153 | 302 | 454 | 153 | 300 | 451 | 302 | 301 | 353 | 266 | 299 |
| Non-Mechanical | .857 | 1.23 | 2.48 | 3.72 | 1.23 | 2.44 | 3.66 | 2.48 | 2.45 | 2.9 | 2.18 | 2.42 |
| Transport: Rail | 2.45 | 3.76 | 4.28 | 4.61 | 3.77 | 4.26 | 4.54 | 4.26 | 4.26 | 4.42 | 4.13 | 4.3 |
| Truck | .283 | .435 | .494 | .533 | .436 | .492 | .524 | .492 | .492 | .511 | .478 | .497 |
| Pipeline | .309 | .475 | .54 | .582 | .477 | .538 | .573 | .538 | .538 | .558 | .522 | .543 |
| Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | 1.62 | 11 | 11.2 | 12.2 | 11.0 | 11.0 | 11.9 | 11 | 11.1 | 11.4 | 11.2 | 11.2 |
| Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 28.8 | 0 | 17.7 | 40.1 | 0 | 17.3 | 39.1 | 19.3 | 17.5 | 17.9 | 17.7 | 17.7 |
| TOTAL | 357 | 499 | 999 | 1506 | 499 | 987 | 1491 | 993 | 990 | 1160 | 883 | 983 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 362 | 758 | 1133 | 359 | 856 | 1233 | 795 | 851 | 947 | 536 | 701 |
| Surface | | 78.2 | 122 | 187 | 76.9 | 134 | 197 | 129 | 134 | 153 | 86.6 | 109 |
| Cleaning: Mechanical | | 266 | 432 | 601 | 259 | 488 | 653 | 442 | 484 | 512 | 338 | 432 |
| Non-Mechanical | | 3.01 | 4.51 | 5.73 | 2.87 | 4.78 | 5.97 | 4.59 | 4.79 | 5.07 | 3.85 | 4.51 |
| Transport: Rail | | 4.23 | 5.95 | 7.38 | 4.23 | 5.84 | 5.97 | 5.88 | 5.85 | 6.02 | 5.69 | 5.8 |
| Truck | | .489 | .687 | .852 | .489 | .674 | .69 | .679 | .676 | .695 | .657 | .67 |
| Pipeline | | .534 | .751 | .931 | .534 | .737 | .754 | .942 | .739 | .76 | .718 | .732 |
| Barge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | | 14.7 | 12.6 | 17.3 | 14.6 | 11.9 | 12.2 | 11.9 | 12 | 12.8 | 12.9 | 12.1 |
| Low-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquefaction | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 0 | 38.3 | 40.9 | 0 | 36.2 | 31.4 | 36.3 | 36.5 | 38.9 | 38.7 | 36.9 |
| | | 729 | 1374 | 1994 | 717 | 1537 | 2140 | 1426 | 1530 | 1646 | 1024 | 1302 |

TABLE J-12

OPERATING ENERGY (trillion Btu/year)

Denver - Raton Mesa

| | | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETER-MINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| 1985 | | | | | | | | | | | | | |
| Coal Mines: | Underground | 32 | 25.1 | 62.1 | 124 | 25.1 | 62.1 | 124 | 62.1 | 62.1 | 55 | 55 | 77 |
| | Surface | 8.97 | 18.9 | 47.9 | 95.8 | 18.9 | 47.9 | 95.8 | 47.9 | 47.9 | 77 | 77 | 77 |
| Cleaning: | Mechanical | 7.17 | 8.97 | 22.6 | 44.9 | 8.97 | 22.6 | 44.9 | 22.6 | 22.6 | 31 | 31 | 33.6 |
| | Non-Mechanical | .233 | .239 | .597 | 1.2 | .239 | 0.597 | 1.2 | .597 | .597 | .682 | .682 | .818 |
| Transport: | Rail | 19.7 | 30.3 | 34.5 | 37.2 | 30.4 | 34.3 | 36.6 | 34.3 | 34.4 | 35.6 | 33.3 | 34.7 |
| | Truck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | .242 | 0 | 0 |
| | Pipeline | .427 | .656 | .746 | .804 | .658 | .742 | .791 | .742 | .743 | 2.43 | .721 | .75 |
| | Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: | Steam Generation | 2.71 | 9.71 | 12.8 | 13.9 | 9.71 | 12.7 | 13.6 | 12.7 | 12.7 | 106 | 13.3 | 12.1 |
| | Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | High-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.51 | 0 | 0 |
| | Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Coke Production | 16.2 | 25.6 | 24.6 | 30.7 | 25.6 | 24.4 | 30 | 24.5 | 24.5 | 25.8 | 26.7 | 23.1 |
| TOTAL | | 87.5 | 119 | 206 | 349 | 120 | 205 | 347 | 206 | 206 | 239 | 238 | 259 |
| 1990 | | | | | | | | | | | | | |
| Coal Mines: | Underground | | 62.8 | 147 | 211 | 62.8 | 162 | 211 | 158 | 160 | 118 | 88.7 | 150 |
| | Surface | | 47.2 | 72.9 | 119 | 47.2 | 72.9 | 119 | 72.9 | 72.9 | 102 | 76.3 | 76.3 |
| Cleaning: | Mechanical | | 91.5 | 122 | 188 | 84.4 | 114 | 118 | 123 | 116 | 115 | 114 | 122 |
| | Non-Mechanical | | 1.98 | 2.74 | 3.01 | 1.84 | 2.64 | 2.81 | 2.81 | 2.68 | 2.38 | 2.35 | 2.74 |
| Transport: | Rail | | 34.1 | 48 | 59.5 | 34.1 | 47.1 | 48.2 | 47.4 | 47.2 | 48.6 | 45.9 | 46.8 |
| | Truck | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pipeline | | .738 | 1.04 | 1.29 | .737 | 1.02 | 1.04 | 1.02 | 1.02 | 1.05 | .992 | 1.01 |
| | Barge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: | Steam Generation | | 14.2 | 26 | 17.1 | 14.2 | 25.6 | 22.5 | 25.7 | 25.7 | 26.6 | 18.6 | 24.6 |
| | Low-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | High-Btu Gas | | 0 | 0 | 3.41 | 0 | 0 | 3.02 | 0 | 0 | 0 | 0 | 0 |
| | Liquefaction | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Coke Production | | 27 | 36.8 | 280 | 27 | 35.9 | 24.8 | 35.9 | 36.1 | 37.8 | 37.5 | 34.1 |
| TOTAL | | | 280 | 456 | 823 | 272 | 462 | 550 | 467 | 462 | 451 | 385 | 457 |

TABLE J-13

OPERATING ENERGY (trillion Btu/year)

Others

| | 1976 | PREFERRED LEASING POLICY | | | NO NEW LEASING | | | PRLA's ONLY | SHORT-TERM LEASING ONLY | MEET INDUSTRY NEEDS | MEET DOE TARGETS | STATE DETERMINATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH | MEDIUM | MEDIUM | MEDIUM | MEDIUM | MEDIUM |
| 1985 | | | | | | | | | | | | |
| Coal Mines: Underground | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface AZ | 229 | 403 | 66 | 147 | 403 | 92.4 | 147 | 83.2 | 84.7 | 150 | 145 | 39.6 |
| Cleaning: Mechanical | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Mechanical AZ | 1.6 | 2.82 | .462 | 1.03 | 2.82 | .647 | 1.03 | .582 | .593 | 1.05 | 1.02 | .277 |
| Transport: Rail | 23.9 | 36.8 | 41.8 | 45 | 36.9 | 41.6 | 44.4 | 41.6 | 41.6 | 43.2 | 40.4 | 42.1 |
| Truck | .134 | .806 | .234 | .252 | .207 | .233 | .248 | .233 | .233 | .242 | .226 | .235 |
| Pipeline | 1.35 | 2.07 | 2.36 | 2.54 | 2.08 | 2.35 | 2.5 | 2.35 | 2.35 | 2.43 | 2.28 | 2.37 |
| Barge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | 76.5 | 99.5 | 105 | 121 | 99.5 | 104 | 120 | 104 | 104 | 106 | 105 | 105 |
| Low-Btu Gas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | 0 | .707 | 3.48 | 5.56 | .707 | 3.48 | 5.53 | 3.48 | 3.48 | 3.51 | 3.49 | 3.46 |
| Liquefaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | 186 | 222 | 333 | 255 | 249 | 330 | 254 | 330 | 331 | 336 | 332 | 334 |
| TOTAL | 519 | 767 | 552 | 578 | 794 | 575 | 595 | 506 | 569 | 642 | 629 | 528 |
| 1990 | | | | | | | | | | | | |
| Coal Mines: Underground | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface | | 317 | 235 | 200 | 317 | 227 | 8.8 | 190 | 225 | 81 | 183 | 310 |
| Cleaning: Mechanical | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Mechanical | | 2.22 | 1.65 | 1.4 | 2.22 | 1.57 | 0 | 1.33 | 1.58 | .567 | 1.28 | 2.17 |
| Transport: Rail | | 41.4 | 58.1 | 72.1 | 41.3 | 57 | 58.3 | 57.4 | 57.2 | 58.8 | 55.6 | 56.7 |
| Truck | | .232 | .325 | .404 | .231 | .319 | .327 | .321 | .32 | .329 | .311 | .317 |
| Pipeline | | 2.33 | 3.28 | 4.06 | 2.33 | 3.22 | 3.29 | 3.24 | 3.22 | 3.32 | 3.13 | 3.2 |
| Barge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conversion: Steam Generation | | 111 | 162 | 225 | 111 | 157 | 160 | 158 | 158 | 165 | 165 | 159 |
| Low-Btu Gas | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High-Btu Gas | | 2.72 | 3.4 | 5.47 | 2.72 | 3.4 | 3.03 | 3.43 | 3.4 | 3.42 | 3.1 | 3.34 |
| Liquefaction | | 0 | 0 | 1.12 | 0 | 0 | .624 | 0 | 0 | 0 | 0 | 0 |
| Coke Production | | 290 | 341 | 293 | 290 | 335 | 286 | 335 | 335 | 344 | 264 | 338 |
| TOTAL | | 767 | 806 | 803 | 767 | 784 | 520 | 748 | 784 | 656 | 675 | 872 |

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